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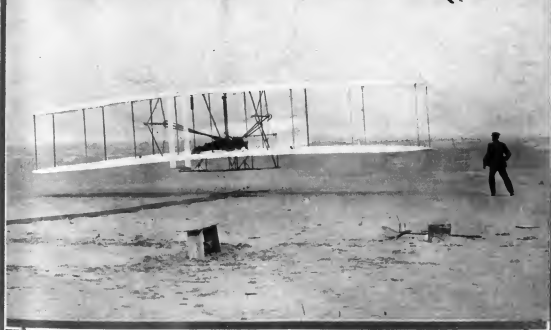
The Oldest American Aeronautical Magazine

DECEMBER 1, 1928

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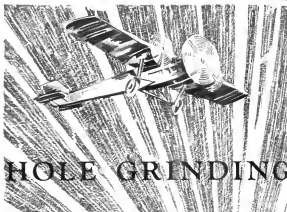
Orville Wright making the first flight in a heavier-than-air craft, Dec. 17, 1903

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The Oldest American Aeronautical Magazine

Vol. XXV

DECEMBER 1, 1928

No. 23

The Conquest

A QUARTER of a century has passed since the Wright brothers' airplane left the sands of Kill Devil Hill. It is strange that we calculate the event with the accuracy, for it was the fulfillment of a dream which is probably as old as man's conscious thought. This quarter century, during which it has been proved that the Wright brothers had fulfilled the dream of countless generations, have been marvelous years in all steps of endeavor, but the definite conquest of the air will stand out as the great achievement of the period. Flying has required more courage, more faith and more varied knowledge than any other of our mechanical achievements. The automobile, radio and the motor have all had their great runs, but none of them required, as received, such complete cooperation of all known sciences as has been necessary for the development of the airplane.

Airplanes are a synthesis of all branches of physical knowledge. The dream became reality through the contributions of thousands of workers in other fields. The airplane is, from the aeronautical standpoint, the finest example of the cooperative efforts of modern civilization but none of this would have resulted without the high energy and steadfast faith which has been shown by the individuals who were willing to give authenticity of all they had in order that the airplane might be perfected. The airplane is not only the greatest mechanical achievement of the age, but it is a spiritual victory far beyond which has rarely been equaled. This line is hardly deflected in the many known and unknown workers who, through their sacrifices, have added such a brilliant chapter to the history of mankind.

The Future

CHICAGO'S great aeronautical show is a cross-section of the industry as it is today. There are a great variety of planes from which to choose, and many other planes are bound to be manufacturing data. There are also an impressive number of engine builders. Exhibitors of accessories are there by the dozen. Airlines and airports are represented and those present will have the opportunity of making the status of present day aeronautics. Those reading this issue will be reminded of the developments of the last twenty-five years, but what we are all most interested in is what will be the developments during the next twenty-five years.

Discussion on this important subject must be based largely on the disposition of the airplane. There are black days when even the most optimistic admit that aircraft have become an insurmountable difficulty to overcome before they attain the overruling success which is justified for them, there are days when the sun sets and we believe that what we see and hear at the

Chicago Show is just a faint beginning of things to be. Probably both of these states of mind are partly correct. There is no reason to believe that within the next few years the aeronautical industry will rival the automobile industry in the number of units produced, there are still too many difficulties to be overcome. On the other hand, airplanes have proved their value so much so that their increased use is almost inevitable. The saturation point of airplanes is probably as far off as the saturation point of automobiles. Every year should show a definite and fairly steady percentage of increase, and this would mean that within a few years the annual increase will surpass our whole present production. This percentage basis of increase will be made possible by detailed improvements in design and in operating facilities. Automobiles are fundamentally the same as they were twenty-five years ago, and the expenditure increase in their use has been due to better roads and to refinements in design.

Many of the difficulties about flying, which now seem almost insurmountable, will be eliminated by the mere increase in the number of planes. When there are enough planes, every life saving will have its heading light. When there are enough planes, detailed weather reports will exist for the whole country. When there are enough planes production costs will be infinitely lower and when there are enough planes, engineers will learn to build them so that their operation is easier and safer.

It is possible that there will be some radical and revolutionary discovery or invention which will put flying on a new basis, but this is not necessary to meet a fairly large and steady increase in the growth of the business during the next twenty-five years. Improvements in the accessories to flights are just as important as improvements in the planes themselves. More and better airports, better weather reporting, better instruments, especially altimeters and radio direction finding instruments, will be of enormous value in making flying safer and more practical. As far as planes go they must be made to run at a great angle and also to descend more slowly and at lower speeds. Engines must be made more reliable and easier to maintain. The cumulative effort of the solution of all these individual problems is hard to imagine, but it will make possible the steady and progressive growth of the aeronautical industry.

In so far as its financial history is concerned aeronautics will probably follow the same course as every other new industry, but the development of its various phases will probably be more rapid. Some few companies will make a success from the beginning, others, while fundamentally sound, will have to be reorganized, while many will go under completely. Throughout all these changes and adjustments there will be a steady forward progress of the industry as a whole, though at a variable rate. It will have become nearly subdued even by the end of the next twenty-five year period.

Twenty-Five Years of Famous Flights

By R. SIDNEY BOWEN, Jr.

A T approximately half past ten o'clock on the morning of Dec. 17, 1903, Orville Wright piloted the famous Wright powered Wright biplane a distance of a little over 120 ft. in 12 sec., at a maximum altitude of 30 ft. and at a speed of slightly over 20 mph. That flight which has gone down in history as man's first successful attempt to stay aloft in a heavier-than-air craft was one of four flights made that historic morning at Kitty Hawk, N. C., the longest of which was made by the late Wilbur Wright for a distance of 852 ft. in 59 sec.

In the quarter of a century that has passed since the memorable occasion the original flight records established by the Wright brothers have been broken and replaced countless times and the airplane has progressed to the point where it is being used in every day life the world over. Today the records show that an airplane has attained the speed of 318.628 mph., has been flown a complete distance of 4,675 mi., has remained aloft for 60 hr. 31 min., and has reached an altitude of 38,474 ft.

The object of this article is to present year by year, the details relative to famous flights so that one may obtain an idea of the progress made in airplane performance since Dec. 17, 1903.

Following their successful experiments in the later part of 1903 the Wright brothers returned to Dayton, O., and carried on with their work with a considerable amount of secrecy so that during 1904 very little was known of their progress. However, during that period they made

over 100 flights in their machine, and the longest is reported to have been made for a distance of 1,277 ft.

In 1905 the Wrights were still continuing to make progress and on September 26 of that year a flight of 11 min. in length was made. On September 30 the distance was increased to 12.5 mi.; on October 3 to 15.23 mi.; on October 4 to 29.75 mi.; and on October 5 the longest flight then far was made—a flight of 24.25 mi. All of the flights were made at a speed of about 38 mph., and without accident. The October 5 flight lasted for 38 min.

Although the article deals with heavier-than-air craft performance, mention should be made at this point of an event that took place at Santa Clara, Calif., on April 29. A glider designed by Prof. John J. Montgomery and piloted by Daniel Maloney was released from a balloon at the height of 4,000 ft. Maloney then performed glides, dives, spirals, figure eights and level flying against the wind. The top speed was estimated at 68 mph. and the distance flown was approximately eight miles in 20 min. A landing was made on a pre-arranged spot and so well executed that the pilot was not even injured, although he had to land on his feet due to the absence of a special landing gear. The flight is regarded as one of the greatest single advances in the history of flying.

In 1906 the situation of France dramatically inclined was attracted to France where Santos Dumont, a Brazilian by birth but a long resident of Paris, was performing with his Blériot No. 1. On October 22 he made the first

officially observed flight recorded by the Aero Club of France. By flying a distance of 164 ft. Dumont thereby won the Archambault Cup previously referred to later. Archambault, who did much to encourage aviation in the early days. The flight was made at Issy-les-Moulineaux, and on the thirteenth day of the following month Dumont made three successful flights for distances of 187 ft., 271 ft. and 722 ft. respectively. During the last of these Dumont remained aloft for 21.30 sec. It is to be noted that this performance in 1906 did not equal the Wright performance in 1903.

During 1907 attention continued to center on French activities. Jean Farman, Louis Blériot, Leon Delagrange, Robert E. Pecheux and Santos Dumont were all successful in getting their planes off the ground and remaining aloft for various periods of time. Between April 3 and December 6 Louis Blériot made eight flights in his Blériot monoplane, the first being about 100 ft. in length and the longest being 1,976 ft. in length. On his last flight Blériot made his first turn.

On October 26 Farman made his first turn while in flight. At the time he flew a Voisin for a distance of 2,520 ft. at day. His first flight was made on October 15 when he flew 905 ft. He also made two other flights 1,199 ft. and 1,322 ft. during the month. The longest flight made by Delagrange during 1907 was for a distance of 656 ft., the longest made by Pecheux was 492 ft. in length, and Dumont's record for the year was a flight of 852 ft.

The year of 1908 is regarded as the real starting point in modern aviation, and was in general flying what the year of 1907 was to past year flying. The first event of importance took place on January 13 when Jean Farman won the Grand Prix d'Aviation of \$30,000 francs at Issy, France, by making the first officially observed circuit flight. Farman piloted his Voisin plane was Wil-



An active pioneer of Santos Dumont going aloft in his monoplane "Blériot" with a 17 ft. wing span.

sonnet in a closed circuit. He also made other flights during the year, and his longest flight was for a distance of 25,474 mi. He also succeeded in remaining in the air for 44 min. 32 sec. during a flight 24,834 ft. in length.

On June 8, A. V. Roe made the first English flight at Brooklands in a tri-plane of his own design and construction. The plane was powered with a 24-hp. Antares engine and Roe piloted at about 75 ft. at a height of two feet.

Up to this time the Wright brothers had confined their experiments to flights over American territory but with the

coming of summer in 1908 Wilbur Wright took one of his planes to France and set up camp near La Mure and proceeded to establish the plane and demonstrate American aeronautical ability. On August 6 he made his first French flight which lasted 1 min. 47 sec. and was 135 mi. in length. From then on he continued to make several flights under contract, but it was obvious that his best time was still . . . 20 sec. on September 5 at Avocour. . . did not indicate the complete performance of the plane, when, on September 9, news was received that Orville Wright had stayed aloft at Ft. Mager, Y., for 1 hr. 2



Leon Blériot, first man to fly the English Channel, in his Blériot monoplane No. 1.

min. 30 sec. It was altogether fitting that the "over-the-horizon" question never be made in an American plane while flying over American ground. On September 12 Orville Wright increased this record to 1 hr. 15 min. 29 sec. The best record having been made over American territory, Wilbur Wright took his place up on September 21 and flew nearly 64 mi. in 1 hr. 35 min. 25.60 sec. He continued to make many more flights in France, some of them with passengers, and on December 16 he stayed up 1 hr. 53 min. 29.50 sec. and won the first Michelin prize of \$500.

Another notable flight of 1908 was made at July 4 by Glenn H. Curtiss who piloted his "June Bug" at a speed of 33 mph. at Hammondsport, N. Y., and won the Scientific American trophy. Two days later, according to the records, the first woman to fly, Miss Thérèse Pichon, went up with Delagrange in a Voisin at Turin, Italy. The second best all European flight of the year was made by Leon Delagrange on September 5 at Issy, France, when he flew his Voisin 15,864 mi. in 39 min. 33.80 sec.

The final event of importance for the year of 1908 occurred on December 31 when Wilbur Wright went up at Avocour, France and flew 90 mi. in 2 hr. 20 min. 28 sec. It is stated in the records that only 75.5 mi. of this flight were counted as official. An interesting thing of note is mentioned with Wilbur Wright's flights in France, to first between August 8 and October 10 he spent 12 hr. 49 min. in the air and carried 13 persons a distance of 431 mi. without a single accident.

Although it cannot be placed under the heading of heavier flights, as then of various in connection with the year of 1909 is that on January 9 the Aero Club of France named the first pilot's certificate. These certificates were issued to Leon Delagrange, Santos Dumont, R. L. Doolittle, Pecheux, Henri Farman, Wilbur Wright, Orville Wright, Captain Fisher, and Leon Blériot.

The first aerial event of importance took place on April 8 when Santos Dumont flew his 17 ft. monoplane "Demoiselle" over country for a distance of 2.5 km.



Orville Wright making his historic flight at Kitty Hawk, N. C., Dec. 17, 1903. Wilbur Wright is seen at the right of the picture.

The next flight of note that was made that year was one which had gone down in aeronautical history as one of the greatest aerial achievements ever accomplished. On July 25, Louis Bleriot took his monoplane off the ground at Calais, France, and about 40 miles later landed it on North Head in Ireland, Dover Coast, England. This was the first time in the history of the world England and the Continent were connected by air. The airline distance between the two points of that great flight is about 25 mi., and, according to the records, Louis Bleriot maintained a speed of about 45 m.p.h. Prior to the Channel flight Bleriot had made a 25 mi. non-stop flight between Etampes and Orleans. As has happened on more than one over-water flight attempted since that date, Bleriot lost his bearings and did not land where he intended to land. That it happened that the "error" that retarded the completion of one of the most famous flights in history consisted of one English constable. In making the Channel flight Louis Bleriot won the London Daily Mail prize of \$1,000.

Currier Wins Gordon Bennett Race

During the latter part of August the leading aviators of the world gathered together at Reims, France, to take part in the aerial review that made up the program for the Reims Aviation Week. The main event was the Gordon Bennett Trophy race, which, according to the records was open to all types of heavier-than-air craft. This event was won for America by Glenn H. Curtiss when he flew his Curtiss biplane over the 20 km. course at a top speed of 45 m.p.h. Mr. Curtiss had made several successful flights during the early part of the year at Hammondsport, N. Y., and Mineola, L. I., N. Y. In addition to winning the Gordon Bennett Trophy race Curtiss also flew his Curtiss biplane to first place in the 30 km. event.

On October 18 Count de Lambert took his Wright biplane off the ground at Jersey, France, and proceeded to surround the aeronautical world by flying over the city of Paris and making a complete circle of the Eiffel Tower. The feat was considered at the time to be one of great importance, and undoubtedly it can be recorded as the first violation of the present "flying over occupied area" ruling.

Among the other famous flights made during the year of 1909 was the winning of the London Daily Mail prize of \$1,000 by J. T. C. Moynihan when he succeeded in completing a circular wide flight with an all-British plane over British territory. Another aerial

achievement was the crossing of the Strait of Solent by Walter Wright in a Wright biplane, and still another, the crossing of Goosnargh Island by Glenn Curtiss in his Curtiss biplane. It is also recorded that on October 2, Oswald Wright crossed a height of 1,617 ft. at Berlin, Germany. The last flight of any importance in 1909 was the winning of the Michelin Cup and the establishing of a



J. J. R. R. R. getting off in his Aero Triplane, at Les Marais, England, 1909.

world's cross-country record by Stuart Prouton on November 8 when he piloted his Parnall biplane a distance of 144 mi. in 4 hr. 17 min. 33.0 sec.

The first flight to win world prize in 1910 was made on April 27 and 28. Prouton, a young Frenchman, who had "won his wings" in France but a short time before, successfully piloted his Parnall biplane from London to Manchester, England, with an over-night stop at Lichfield. This distance flown was 596 mi. and the total flying time was 4 hr. 11 min. By making the flight Prouton won the \$10,000 prize offered by the London Daily Mail. The famous English aviator, Claude Grahame White, also won the flight but was forced down for various reasons and before he could get under way for the last effort, Prouton had completed the flight.

On May 21 Jacques de Lesseps made the second crossing of the English Channel by air. He piloted a Bleriot monoplane with a Gnome rotary engine from Calais to Dover, a distance of 37 mi. in 42 min. Another famous



over-water flight was made in America right after, later when Glenn Curtiss flew his Curtiss biplane from Albany to New York City, with one stop in route. The entire distance is 190 mi. and Curtiss' flying time was 2 hr. 32 min. at an average speed of 34 m.p.h. Another aerial feat accomplished by Curtiss was a successful landing on the waters of Lake Michigan, at Hammondport, N. Y., during the early part of June.

It would seem that over-water flying was the favorite sport during the first six months of 1910 for as just 2, 5, 22, 24, 25 and 26 French built Wright biplanes from the English coast to the French coast, and returned to England without making a landing on French soil. The time of the flight is recorded as being a little over 1 hr. 30 min. The crossing Atlantic record went by the board during the first few days of August when George Church took a Parnall biplane aloft in Scotland and succeeded in reaching an altitude of 5,880 ft. During the same month the Frenchman, Lefebvre won what is believed to have been the first aerial tour ever organized. It was headed by the Circuit de l'Est and was conducted by the French newspaper, Le Matin. Lefebvre piloted a Gnome powered Bleriot over the 300 mi. route in a total flying time of 12 hr. 1 mi. 1 sec. Another French pilot by the name of Audren was second place in a Bleriot with a total flying time of 13 hr. 31 min. 9 sec. Lefebvre and Audren were the only two of eight starters to complete the tour.

First Paris-London Attempt

The first attempt to fly from Paris to London was by Georges on August 16, when J. B. Monnet and a mechanic took off in a French plane. Several landings from one hundred and one different troubles delayed the progress of the flight so much that it was nearly three weeks to a day before Monnet landed at London.

In the Fall of 1910 Claude Grahame White won the Gordon Bennett Cup for England. He also won the Boston Globe prize when he made the Squantum, Mass., to Boston Light and return flight in 18 min. 1.40 sec. Several flights of prominence were made in Europe during this time. On September 11 Robert Lissard, an Englishman attempted to fly the Irish Channel. When he was forced to land in the water he was but a few yards from the shores of Ireland. The other Ireland was won by George Church on September 23 when he piloted his Parnall biplane across the Alps at Donau and made a successful landing at Bayreuth.

Considerable time the setting of a new world's altitude record when on the twenty-fourth day the American pilot, A. Hasty went up to 11,470 ft. at San Francisco, Calif. On the twentieth day of that month Latham, a French pilot set a distance record when he flew the French biplane Cap by piloting his Bleriot plane 360 mi. in 7 hr. 45 min. at Reims, France. On the last day of the month S. F. Cody won the British Michelin Cup at Lark's Place, England with a flight of 182 mi. 212 yd. A short time before Cody landed T. D. M. Smith set his plane on the ground after a flight of 180 mi.

For quite some time the London Daily Mail had been offering a prize of \$10,000 before the feat of acquiring airman. To gain the prize one had to make an aerial flight around Britain's borders. In the spring of 1901 the much sought for prize was won by Lieutenant Conness who completed the circular flight some distance ahead of Vaudry. Both pilots were Frenchmen. Four pilots completed the prize the other two being S. F. Cody and J. Vaudry, both of whom completed the flight but did not "place in the money."

At about the same time to the "Round Britain" race was being held there was a competition in which a flight was the first of its kind, and which might be con-

sidered as the retail step in the establishment of what is today recognized as the greatest aviation service in the entire world. The United States Air Mail. A Curtiss plane, piloted by a man whose name is not mentioned in the records available, took off from the Nassau Boulevard, Nassau, Long Island, N. Y. The passenger in the plane was the Hon. Frank B. Woodcock, postmaster general, and on his knees he carried a bag of mail. When



Glenn Curtiss up at Sheepshead Bay, Long Island, N. Y., in 1910.

the plane passed over Mineola, L. I., the Postmaster General threw the mail bag over-board and thus made the first air mail delivery in the history of flying.

Another aerial "tour" performed in 1911 was executed on January 18 when Eugene Ely successfully took off from the deck of the U. S. S. Pennsylvania in San Francisco Harbor. The feat has been duplicated by countless pilots since that date, but, according to many sources of information, Ely was the first aviator to perform the stunt successfully. On February 11 Glenn Curtiss successfully flew from land to water and from water to land. The flight was made at San Diego, Calif.

Although several pilots had gone, it was left to M. Prier, a French pilot to make the first non-stop airplane flight between London and Paris. On April 12, Prier took off from London, and in 3 hr. 30 min. he had flown the 250 mi. stretch and made a successful landing at Paris.

July 11 was the day on which a famous flight was made by Harry N. Arnold, known at that time as "The King of Air." Piloting a Burgess-Wright biplane, Arnold made a 421 mi. flight in 10 hr. 45 min. and landed with eight stops en route. Three days later he took off

again in his plane and landed on the grounds of the White House and called on the President. Another great flight made by Alcock was completed on August 26 of that year when he landed safely at New York after a four day, 21 day, 3,155 mi flight from St. Louis, Mo. In making this flight Alcock won the Victor Dumas prize of \$10,000 and established a new world's cross country record.

All of the famous flights of 1911 were not made by American pilots. On August 27 Henri Farman won the Champagne prize of \$10,000 when he flew 123.50 mi in 3 hr 4 min 56 sec. The flight was made during the Blériot-Boston Aero Meet, and a few days before, T. O. M. Sopwith won the Boston Light race in 31 min 33 sec, beating Graham White's best time for the course by over two minutes.

Another event that must be added to the 1911 list was performed by the famous acrobatic flier, Lincoln Beachey. On June 28 Beachey succeeded in flying over Niagara Falls, under the suspension bridge first connects the United States with Canada, and right on down the gorge. That alone, without question, was the most dangerous one performed during the year.

The winner of the 1911 Gordon Bennett Cup event was C. T. Weyman who piloted a Blériot monoplane over the course at an average speed of 50 m.p.h. The final important flight of the year was completed on November 5 when Caliph P. Rogier landed his Wright biplane at Pasadena, Calif., after a 49 day, 18 day, non-stop voyage from New York City. That flight was the first trans-continental crossing by air.

The outstanding flight made during 1912 centered mostly of attempts to better the existing air records. On January 13, the French pilot Vedres established a speed record of 92 m.p.h. on a military type of Deperdussin. On January 22, Fischer reached an altitude of 4,593 ft. in a military Farman biplane carrying two passengers. And on the same day Maurice Prevoost established a world's altitude record when he piloted a military Deperdussin to a height of 22,500 meters carrying three passengers.

The second trans-continental flight was completed on February 4 when Roland G. Power landed at Jacksonville, Fla., after a 51 day trip from San Francisco. It will be noted that Power's time for the first west-east flight across the continent was two days longer than Rogier's time for the first east-west transcontinental flight which was completed November 5, 1911.

The records show that on November 22 a French pilot

by the name of Rogier made successful flights with a seven passenger hydroaeroplane in Bay, France. The plane was designed by Colonel Voisin and was powered with a 200 hp. Clerget engine. They also show that the master of record breaking in 1912 was not confined entirely to the "sooner" rule. On November 21 a Russian aviator, Miss Golitschinsk, took a Fokker monoplane up to 3,490 meters to establish a woman's altitude record. The flight was made at the Johannthal Aerodrome located near



Groffle Wright getting off at Ft. Meyer, Va., Sept. 12, 1908.

Reims, Germany. Perhaps the Russian lady's flight served as an inspiration to make plans, for on December 15, Roland Garros reached a world record altitude of 29,552 ft. at Tonn. Garros set his new altitude record with a Morane-Saulnier monoplane.

The premier racing event of the year was the Gordon Bennett Cup race which was won on December 12 by Jules Velours who flew his Deperdussin plane over the 80 km course at Coarage Aerodrome, Chicago, Ill., in 6 min 33.55 sec. The plane was powered with a 140 hp. Gnome engine.

The first flight made in 1913 that attracted the attention of the press surrounded the world was a 300 km trip from Pau, France, to Madrid, Spain, made on January 24 by Clément Ader, a French pilot. Ader crossed the Pyrenees at their widest point which necessitated a flight of 129 km. over the mountains. The next event of importance was a 1 hr, 10 min 47 sec flight made on February 10 in an Aviatik biplane carrying five passengers and pilot. The pilot was A. Fuhrer; the plane was powered with a 100 hp. Argus engine and the flight was made in Germany.

The world's altitude record came in far more attention

on March 11, when the French pilot Perreyon took a Blériot monoplane up to 19,635 ft. And on April 16 the first Jacques Schneider Military Aviation Cup race was flown at Monte Carlo. Maurice Prevoost won the event in a Deperdussin hydroaeroplane powered with a 100 hp. Gnome engine. Prevoost's average speed over the 150 nautical mile course was 45.5 m.p.h. This is emphasized by the fact that he was slowed down before he reached the finish line and turned around, and was made to go back to the landing point and fly across.

Another passenger carrying record was established at Chateau, France, during the month of March when J. Froust staged a loop for 31 min 48.40 sec. with eight passengers in a Savary biplane powered with a 110 hp. Salmson engine. And another cross-country record was set by the board during the month of June when Blériot flew a Morane-Saulnier monoplane from Paris to Warsaw with a stop at Berlin in the total time of 11 hr. The distance covered on the flight was 933 mi.

On September 1 the French pilot Pégoud started the aerobatic world by executing the first voluntary loop-the-loop in a Blériot monoplane at Jevry. In view of the fact that the records from Pégoud's great feat of acrobatics as the first voluntary loop, it is so to be assumed that innumerable acrobatic loops had been made up to that time.

The 1913 Gordon Bennett Cup race was held in France on September 29 and was won by Maurice Prevoost who piloted his 150 hp. Deperdussin monoplane to first place with an average speed of 53 m.p.h. The last event of the year that was of noteworthy importance was the first flight over the Pyrenees of Glushko made by Marc Pource in a Morane-Saulnier monoplane on December 17.

In the year of 1914 there were only four aerial achievements of any importance prior to the outbreak of the World War. The first took place on February 8 when the German pilot, Karl Löffler established a world's duration record by staying aloft for 16 hr 20 min. Löffler took off at 7:35 A. M. and dove 4,250 km before he landed at 11:35 P. M. The last few hours of the flight



The Army T2 Faber in which Lieutenant Maxwally and Kelly crossed the continent non-stop.

were made in total darkness. This record did not stand for long, however, for on May 2 the French pilot Poulet flew a 60 hp. French biplane between Etampes and Orleans for 16 hr 28 min 56.80 sec. The distance reported to have been flown by Poulet during that time was 536.80 km.

America's participation in record breaking during the early months of 1914 consisted of a flight by Laus, T. F. Dodd with a passenger from San Diego to a point four miles north of San Francisco, Calif., in 4 hr 42 min. The average distance in 294.50 km and the flight established an American cross country (with passenger) record. The one racing event of the year was the second Jacques Schneider Military Aviation Cup race held on the day of Monaco. This 190 nautical mile speed contest was won by an Eng-

lishman, C. Howard Proust, who piloted his 300 hp. Gnome powered Sopwith hydroaeroplane to first place with an average speed of 66.8 m.p.h.

Then came the World War. To try to record the outstanding aviation flights made during that four year period would be to attempt the impossible, for each flight was made for strictly military reasons, and no thought was given to the establishing of flight records. Therefore, for the purpose of this article we will omit details regarding the many and varied flights, and merely set down in type the names of some of the most famous pilots who made the flights during the World War. They are: Munnick,



Flight picture of Alex Gubbins near the end of his 15,000 mi. London-Cape Town-London flight.

Ball, Bishop, McCulloch, Hackenbacker, Luffberg, Polman, Leff, Pook, Gaymard, Mungesser, Baraco, Haradach, Van Borchdoel, Udel and Immanuel. As regards airplane performance progress made during the period of the World War one might compare the facts of 1913 with those of 1918, which will be recorded next. However, it should be remembered that all aerobatic progress made during 1914-15-16-17-18 was made with the military point of view in mind.

The first aerial record of the year of 1915 was the setting of a world's altitude (with passenger) record by Captain Lang R.A.F. who reached an altitude of 30,800 ft. over England on January 2. On February 12, Lieut. H. W. Harnard established a new world's altitude record by logging a segment "Cannon" 115 times in Borealis, France. The next record to go by the board was the American speed record, when, on February 21, a Thomas-Morse Scout powered with a 300 hp. Hispano-Suiza engine was piloted 164 mi up to Alaska, N. Y.

On May 30 there began the first successful crossing of the Atlantic ocean by a heavier-than-air craft. On that day the Navy hydroaeroplane NC-5 commanded by Lieut. Commander Albert C. Read took off from the water at Tuckahoe, N. Y., and landed at Flores, Azores. From the Azores the refueled plane headed for Portugal, Spain, and from there by easy stages to Plymouth, England where it arrived on May 31. The original crew of the NC-5 flight was made from Rickenbacker, L. J., on May 8. From there the plane proceeded to Cape Cod, Mass., to Rockland and on to Tiquary. The trifling distance of the Tripostage-Plymouth flight is 4,791 mi. and the total flying time from Rockland to Plymouth was 53 hr 38 min.

During the following month the greatest airplane over-water flight in the history of the world up to that time was accomplished. A Vickers-Vimy-Jolls biplane powered with two 180 hp. engines 400 hp. "Vickers" VIII engine and piloted by Capt. John Alcock and Lieut. Arthur W. Brown made a non-stop flight from St. John's, N. F., to Clifden on the Irish Coast. The entire distance of between those two points is 1,900 mi. and the flight was made in 15 hr 57 min.

The next famous flight, also a long distance affair, was



Pennell, winner of the 160 mi. London-Manchester, England, flight ready to take off in his Farman biplane.

made between July 24 and November 9. Under the command of Lieut. Col. R. S. Hama, as pilot, K. E. Hama as assistant pilot, and S. J. Haring and J. B. Hama as mechanics, a twin engine (400 hp Liberty) Martin Bomber was flown "Round the Rim" of the United States. The flight, which was made for a distance of 9,823 mi., was the longest ever attempted by the Air Service up to that time, and was completed in 114 hr. 45 min. actual flying time.

While the Round the Rim flight was in progress the world's altitude record was broken by an American (also flying an American plane). The pilot was Roland Roberts and the plane used was a Curtiss-Wright Cyclone powered with a Curtiss K-12 400 hp engine. On September 18, Roberts took the plane up to 34,910 ft. However, calibration of the barograph by the Bureau of Standards showed a minimum corrected altitude of 32,430 ft. That figure stood as the world's altitude record.

A looping record having been established, plans on both sides of the Atlantic made various attempts to raise the total number of loops. The most successful attempt of the year was made in October 28 when the French pilot Albert Flament looped a French military plane 624 times in two hours, thereby setting the original record by over 180 per cent.

The last great flight of that year of long distance flights was accomplished between November 12 and December 10. The flight was the longest made from far and was made from Honolulu, American Samoa, London, Port Darwin, Australia, with stops enroute, by Capt. Ross Smith in a twin engine (400 hp Rolls Royce Eagle VII) Vickers Vimy Racer biplane. The distance flown by Capt. Ross Smith was 11,200 mi.

The breaking of the world's speed record was the first event of extraordinary importance in 1922. On February 2 the French pilot Sach Lecomte flew a Nieuport biplane 171.3 m.p.h. at Villacoublay, France. Thus came the first long distance flight of the year by two Italian aviators, Lieutenant Fresco and Major Fregg. Flying an S. V. A. plane they took off at Rome, Italy, on February 14 and landed for Tokyo, Japan, 10,370 mi. away. After several stops en route the pair arrived at Tokyo on May 31. The plane was the only one of 10 planes competing in the long

distance event to successfully reach its intended destination.

Then came America's turn to break a record. On February 26, Maj. C. W. Schroeder took a 400 hp Liberty Packard Lepore biplane up to a new world's altitude record of 33,114 ft. The flight was made over McCook Field, Dayton, O. On June 21, two French pilots, Boncourt and Bervand set a world's endurance record when they stayed aloft in a Farman "Goliath" (two 200 hp Solvay engines) for 24 hr. 19 min. 7 sec. at Villacoublay-La-Mureaux, France.

The next event was a 9,000 mi. flight from Manila, I. to Rome, Italy, and return by four D.14 planes commanded by Capt. St. Clair Street. The flight which was made in a total flying time of 112 hr. and at an average speed of 80 m.p.h. was started on July 15 and completed on October 26.

A Lopsided 87 Times

The incentive to establish looping records having been provided by the male pilots, Laura Stevenson took up a Curtiss Standard J-1 powered with a Curtiss K-6 120 hp engine at Carmel, Ind. I. on August 13 and established a world's record for lady loops by looping her plane a total of 87 times.

The first post war meeting of high speed airplanes took place at Rome, Italy on September 18 and 19. This classic event, the Schneider Trophy Contest was won by an Italian pilot, Lord (Chevalier Luigi) Ragnoli, who flew his Savoia S-55 airplane powered with an Ansaldo engine to first place with an average speed of 107.62 m.p.h. It is interesting to note here that in the course of six years the speed of airplanes had been increased less than 20 m.p.h. while the speed of land planes had been increased over 60 m.p.h. In other words the fastest speed for a land plane in 1912 was only two miles per hour lower than the fastest time for a airplane in 1922. This great difference in speed between the land plane and the airplane does not at all surprise even today.

The next flying event of the year was the Gordon Ben-

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nett Cup race for land planes held at Bologna, France on September 27. The event was won by the French speed merchant Sach Lecomte who piloted his 400 hp Hispano Wapnet 20, 127.20 m.p.h. in 1 hr. 6 min. 12.20 sec. at an average speed of 164.20 m.p.h., about three miles per hour less than the world's speed record he had established in February. As a matter of fact Lecomte set up a new speed mark on October 10 when he flew his 400 hp Hispano Wapnet one kilometer in 12.1 sec. at Bour, France. This speed was calculated at 256,694 km.p.h. or about 185 m.p.h. The flight broke the record of 181.95 m.p.h. that had been set by Captain De Roussant a few days before.

On November 13 at that year's first Pulitzer Race was held at Mitchell Field, L. I., and was won by Louis C. C. Masley who piloted his 600 hp Packard Vernalis over the 132 mi. course in 44 min. 28.97 sec. at an average speed of 178 m.p.h., seven miles per hour below the world's speed record.

The year of 1922 was a little more than four months old when Lieut. J. A. Marmoulis and Ray S. Langdon took a Packard Lepore biplane up to 34,190 ft. and a new world's altitude record at McCook Field, Dayton, O. on May 6. Three months later, August 16 to be exact, David McCulloch piloted a Liberty powered "Looney" or "Yacht" in 19,500 ft. with four persons at Fort Washington, N. Y., and set a new world's hydroplane altitude record. The 19,500 ft. mark was reached in exactly 48 min.

The 1921 Schneider Trophy Contest was held at Venice, Italy on August 6 and 7, and was won by the Italian aviator, Lord Ragnoli who piloted his Savoia S-55 airplane over the course at an average speed of 111 m.p.h. In view of the fact that the airplane speed record had been increased, it seemed altogether fitting that the land plane speed mark be raised also. So on September 22, Sach Lecomte flew his Hispano 20-60 m.p.h. over a



Captains Serenichin and Coulton leading their "Dolph" Ralt powered racer, capture in the water.

course near Paris, France. Thus the difference in speed between land planes and airplanes was raised to 90 m.p.h.

The breaking of world's records seemed to be the vague, Lieutenant Macready took a supercharged Pusher and Lepore biplane up to 31,998 ft. at McCook Field on September 28, and established a new world's altitude record. The plane was the same one used by Major Schroeder when he set 33,114 ft. on February 26, 1920. As at that time Lieutenant Macready was not credited with the world's record due to the fact that his plane had had less than 40,000 ft. However, in 1928 it was discovered that the French pilot had not played "sawtooth to height" and his altitude marks were removed from the record books

and the record awarded to Lieutenant Macready for his flight on Jan. 29, 1926. Of course the record which was awarded was short lived, but doubt regarding that will be soon raised again.

The second Pulitzer Trophy Race was held at Omaha, Neb. on Nov. 3, 1922, and the blue ribbon was by Bart Acosta, who flew his C-12 powered Curtiss biplane over the 155.60 mi. course in 52 min. 9 sec. at an average speed of 170.7 m.p.h., which was raised in the record



The New NCA, the first airplane to cross the Atlantic Ocean.

book as a world's record for speed over a closed course. Back to America came the world's endurance record on December 29 and 30. During that time Edward Stinson and Lloyd Bernard stayed aloft in a Luscombe J-6 monoplane, powered with a 185 hp. 36 M.W. engine, for 26 hr. 19 min. 25 sec. This mark beat the record set by Boncourt and Bervand the year before by two hours.

The year of 1922 now the wholesale attempts to set new speed and endurance marks, which, incidentally were more than marvelous. The first aerial event of the year, however, was the first air crossing of the South Atlantic, which took place between March 30 and June 17. On the first day mentioned Captain Savelle and Captain Constant of the Portuguese Army took off from the water at Lisbon, Portugal, in a Rolls Royce "Eagle" powered twin airplane and after three months flew the route to Pernambuco, Brazil, 3,200 mi. away. Unfortunately upon malfunction the ocean floor hit badly on June 17 they reached their objective after having abandoned two planes.

The race after was the supreme classic for 1922, the Schneider Trophy Contest held at Naples, Italy, on August 12. This year an English pilot, Capt. Henry Charles Bland of the Supermarine Walrus of Great Britain, showed his competitors to the other entries and won the 200 matched mile race in a Supermarine "Sea Lion". Mark II powered with a 450 hp. Napier "Lion" engine. Captain Bland covered the course in 1 hr. 34 min. 5.60 sec. at an average speed of 145 m.p.h. Thirteen days later Biolo-Pila, the well known Fiat test pilot, boosted the land plane speed mark to 208.5 m.p.h. with a 700 hp. Fiat powered Fiat racing plane at Milan, Italy.

On September 5, the first coast to coast trip within 24 hr. was made by Lt. James H. Doolittle when he piloted his Curtiss-Navy racer from Jacksonville, Fla., to San Diego, Calif., in exactly 22 hr. 35 min. making a 1 hr. 15 min. stop at Kelly Field, Tex.

Not during the endurance record to remain on the U. S. side of the Atlantic Ocean for any great length of time, Lieutenant and Doolittle took up a twin engine (400 hp. Renault) Farman Goliath at La Bourget, Paris, on October 14 and stayed up until they had broken the



Alcock and Brown en route to Ireland in their Pitts. First non-stop North Atlantic flight.

record held by Schenck and Bertrand by more than 12 hr. The exact time of the Poncebuen's airborne above area was 24 hr. 14 min. 8.5 sec. However, as a matter of record it should be mentioned that on October 5, 1922, Lieutenant Macready and Childs, 26, Kelly staged up 25 hr. 18 min. 30 sec. in an Army T-2 Fokker monoplane (400 hp. Liberty) over Woodford Field, San Diego. The flight was not recorded as an official endurance record due to the fact that when they had taken off, Macready and Kelly had intended to try a non-stop flight, but, not able had changed their minds and decided to stop up as long as possible. Consequently the flight did not stand as a record owing to the fact that according to F.A.I. rules, the constant consumption of the aircraft was not mentioned had not been notified of any attempt to try for a new endurance record. Perhaps it might be well to mention here that Macready and Kelly proved that it could be done the second time, but that event took place during the following year.

On the same day that Bonaventura and Doolittle hung up a new endurance record, Lieut. R. L. Maughan took first honors in the third Pulitzer Trophy race held at Willoughby Field, Mt. Clemens, Mich. Flying an Army Curtiss biplane powered with a Curtiss D-12 engine, Lieutenant Maughan covered the 250 mi. course at an average speed of 269.8 m.p.h. and established a world's speed mark of 235.21 m.p.h. for 200 mi., and a world's speed mark of 205.94 for 200 mi.

A world's one kilometer speed mark of 212.74 m.p.h. that had been set by Sidi Lacaze in a Nieuport-Delage on September 22, went on the wobble on October 16 when Brig. Gen. W. A. Mitchell laid down a one kilometer straight-away course at Mitchell Field, L. I., in a D-12 powered Army-Curtiss at a top speed of 298.58 m.p.h. This breaking by about 12 m.p.h. the world's speed mark established the record breaking performance.

The year of 1922 was somewhat less 1922 as regards the wholesale slaughter of airplane records. Having lost his speed crown to General Mitchell, Sidi Lacaze promptly proceeded to remove it on February 12 by pilot-

ing after a stay aloft of 36 hr. 4 min. 34 sec., a matter of 44 min. better than their time aloft in 1922, and almost two hours better than the time hung up by the Frenchmen, Bonaventura and Doolittle. Just to show that the plane was still good for record breaking, Macready and Kelly took it all on May 2 and flew non-stop from San Diego to New York, a distance of 2,550.25 mi. in 25 hr. 30 min. This was the first west-east transcontinental nonstop flight in history.

Up to this time the United States had been among the also rans in the Schneider Trophy Contest, but on Sep-



May: Mario De Bernardi in his 1926 Schneider Trophy Contest winner, a Fiat-Marchi M-30.

tember 28, Lieut. David Beinhorn, U.S.N., won the coveted trophy for the U. S. by piloting his D-12 400 hp. powered Curtiss-Navy seaplane racer over the course at Covea, Isle of Wight, England in an average speed of 197.56 m.p.h. In winning this race, Lieutenant Beinhorn also amended the world's speed marks for 200 and 300 km. Following closely on the Schneider Trophy victory, Lieut. "Al" Williams, another Navy pilot, won the 1923 Pulitzer Trophy race held at St. Louis, Mo., on October 6. When Lieutenant Williams finished across the finish line up when the world's speed mark to 243.67 m.p.h.

The next pilot to set up a new world's record was none other than Sidi Lacaze. But this time he turned his attention to going up rather than level flight speed, and on October 30 setted aloft in a 300 H.P. powered Nieuport Delage to 30,564 ft. above Bay, France, breaking by more than 1,000 ft. the record set by Macready on Sept. 28, 1921.

The last achievement of the year was another successful attempt to establish a world's speed mark. On November 4, Lieut. Al Williams flew a D-12 Curtiss-Navy racer over a shorter kilometer course at Mitchell Field at an average speed of 266.50 m.p.h. Thus the year ended with the United States in possession of 34 out of 42 world's airplane records, 22 of which had been set by Navy pilots and 12 by Army pilots.

The year of 1924 will always remain an outstanding period of 363 days in American aviation history, for it was during this year that three American planes, powered by three American engines and piloted by two Americans, men owned the world by far the first time in the history of man. The flight was commenced from Seattle, Wash. on April 2, and completed at that same point on September 8 after a trip of 37,513 mi. at a total flying time of 374 hr. 12 min. Powered by three World Circuit engines, each powered with a 400 hp. Liberty engine started the trip but one was forced out due to a crash in Alaska. The personnel that completed the trip was Capt. Lowell H.



Coole and Leistikow starting their famous plane on Mitchell Field, L. I., N. Y.

ing in 200 hp. Hines Newport-Delage "Seagull" over the one kilometer course at Marseilles at 294.66 m.p.h. However, once again the French speed team dropped possession of the speed record for but a short time. On March 26, Lieutenant Maughan flew a D-12 engine Army-Curtiss over 226.567 m.p.h. at McCook Field, and three days later Lieutenant S. J. Matland, of Oakland to Hawaii here, with the same plane still showed the speed mark up to 239.95 m.p.h.

Possession of the one endurance record by Lieutenant Macready and Kelly was at last obtained on March 29 when they landed their Army T2 Fokker at McCook

Smith and Lieut. Leslie P. Arnold on the "Chicago No. 2," Lieut. Erik H. Nelson and Lieut. John Harding, Jr., on the "New Orleans No. 4," and Lieut. Leigh Wade and Lieut. Henry H. Doolittle on the "Thomas No. 3." The average number of miles per day flown by the trio was 150, and the average speed throughout the entire trip was 79 m.p.h. From Seattle to California the planes were fitted as seaplanes. From California to Alaska, Scotland, the planes were fitted as land planes. From that point to the North Pole were again used, and from the Bay State camped in the finish line at Seattle the ground landing gear was used.

In an attempt on May 21 to regain the altitude record for the United States, Lieutenant Macready was when might be termed so 80 per cent successful. The world's mark stayed at 30,564 ft., but Lieutenant Macready set a new American altitude mark by getting his 400 hp. Liberty engine up to 32,829 ft. The flight was made over McCook Field, Dayton, O.

American airplane achievements having led the course of the stage for the first part of 1924, two French military firms, Lieut. Pelelerin D'Origny and Sergt. Bernard Buisson took off at Paris, France, in a Breguet P.142 jet biplane powered with a 400 hp. Lorraine-Dietrich engine and headed for Tokyo, Japan, some 12,850 mi. distant. Unfortunately a crash at Shanghai, China, delayed the flight for several days but on the forty-seventh day out from Paris the pair landed at Yokohama in a Breguet P.142 presented to them by the Chinese Government. The total flying time for the trip was 120 hr.

Following along the lines that "the third time never fails" Lieutenant Maughan took off from Mitchell Field, L. I., on the early dawn of June 22 and headed west on his third attempt to make a "Down to Dook" flight across the United States. This time he was successful and after 26 hr. 48.50 min., touching three stops on route, he landed his 400 hp. Curtiss powered Curtiss F14-B at San Francisco, Calif.

The most event of import, and incidentally the last record breaking achievement of the year, was the pre-empting at the world's endurance mark by two French pilots, Coupet and Doolittle. On July 15 the pair headed their 450 hp. Parnass powered Parnass biplane at Chartres, France, after a stay aloft of 37 hr. 39 min. 19 sec. The flight was recorded as a world record, and the time was 1 hr. 3 min. 30 sec. better than the time previously set by Lieutenant Macready.

As the series of record breaking performances ended in 1924 so did they begin in 1925. On August 7 Doolittle and Leistikow took off in a 450 hp. Parnass powered biplane at Birmingham, France and stayed up until they had added more than six hours to their 1924 mark. The exact time of their endurance flight was 45 hr. 11 min. 36 sec. The next record, although unimportant, was a short record for a 100 mi. race in a 100 mi. race. On August 31 a Navy FN-9 biplane, powered with two 500 hp. Packard engines, and commanded by Capt. John Rogers, with



Two of the "Round the World" planes riding anchor at Indian Harbor, Labrador.

Lieut. Byron Connell, armed in command, took off from the waters of San Pedro Bay, Calif., at the start of an attempt to fly non-stop to Honolulu, Hawaii. Unfortunately the plane was forced down onto the water a few miles short of its goal, but the distance that it did travel, some 1,952 statute miles, constituted a new world's non-stop airplane and flyboat record.

The Navy having come to the fore, the Army proceeded to step into the record breaking picture. Lieut. Cyrus Bell was the main character involved and the race he played consisted of winning the 1925 Pulitzer Trophy



Capt. Cyrus Bell's new-Smith Atlantic flyboat at Pales, Spain.

race at Mitchell Field, on October 12 in a Curtiss-Amp R3C1 plane powered with a 619 hp. Curtiss V 1400 engine. Lieutenant Bell's average speed for the course was 248.675 m.p.h. A world's 200 km. mark of 249.342 m.p.h. was established by the winning flight as well as a world's 200 km. mark of 248.975 m.p.h.

For the second time in succession the United States was declared the winner of the Schneider Trophy Contest when, on October 26, Lieutenant Doolittle piloted his Curtiss Army racer over the 150 mi. course at Ray Shore, Md., at an average speed of 232.575 m.p.h. Two world's records went with first prize, the 100 km. airplane mark of 234.772 m.p.h. and the 200 km. airplane mark of 244.355 m.p.h. It is interesting to note that there was an increase of over 35 m.p.h. in the speed of racing airplanes between the 1922 and 1925 Schneider Trophy Contests. The speeded speed mark was further increased on the day following the race at Ray Shore. Piloting the same plane Lieutenant Doolittle succeeded in breaking up a new mark of 245.713 m.p.h. A striking comparison between the plane and head plane by speed can be made at this point. It is important that Lieutenant Doolittle set his new one-plane speed mark of 245.713 m.p.h. in exactly the same place that Lieutenant Bell's flew to first place in the Pulitzer Trophy race earlier in the month at a speed of

240-342 m.p.h. for 100 km. The only difference was that Lieutenant Bertin used a landing gear and Lieutenant Ducloux did not. Thus in 1925 there was a difference of a mile under four miles per hour between the top speeds of airplanes and land planes.

The final event of the year was the completion on November 7 of a 34,000 mi. flight (Rome-Melbourne-Tokyo-Rome) by Commander DePinedo, the Italian aviator, in a Savoia flying boat.

The opening record breaking event of 1933 was another successful attempt to set up a new world's altitude record by Lieutenant Macready. "Flying the supercharged Liberty (450 hp.) Leprie biplane, Lieutenant Macready reached 28,704 ft. over McCook Field on January 20. Thus the record was taken away from the French aviator, Sergé Lecomte.

Seven days prior to the landing of the altitude record Commander Romain Frenon and a crew of three started a 6,232 mi., six days, flight from Spitz to Argentina. The flight was completed on February 10 and the total time spent in the air was 60 hr. 59 min. The plane Commander Frenon used was the famous light over the South Atlantic was a twin engined (450 hp.) Napier "Lion" biplane "Wal" flying boat.

On March 13 Allen J. Collins arrived at Cayman Aerodrome, England, and the end of a round trip flight to Capetown, South Africa. Mr. Collins left England on Nov. 14, 1932, and arrived at Capetown on Feb. 17, 1933. The plane used on the famous cross-country flight was a single engined DH-50 commercial biplane.

Then followed the outstanding flight of the year, the rounding of the North Pole by airplane. On May 8, a (Joseph Wright) "Whirlwind" powered Fokker monoplane (Joseph Ford) commanded by Capt. R. E. Byrd and piloted by Lt. Paul Gurnea left Spitzbergen and made the trip to the pole and back in 15 1/2 hr. The plane taken on the flight to the pole was 8 hr. 34 min. This feat was regarded as the greatest piloting and navigating accomplishment thus far.

Two famous long distance flights were accomplished also. The first was a Paris-Peking flight made in six days 14 hr. (June 11-17) by the crack French long distance pilot, Didier Daurier. The second was a non-stop record flight of 2,900 mi. between Paris, France, and Casablanca, Algeria, by a French military pilot, Captain Giner and Lieutenant Doreville.

A little over three months later, Oct. 28-29 to be exact, a new world's nonstop distance record was established by a third pair of French aviators, Cote and Hignat. Flying a 450 hp. Hispan powered Bergey XIX, before they covered a distance of 3,415 mi. between Paris and Djibouti, Perma.

At the 1933 Schneider Trophy Contest it was Italy's turn to go away with the flying trophy. Flying to 800 ft. Fiat engined searles received Maresca 31-30 unplane Major

de Bessard finished across the finish line with an average speed for the course of 244.636 m.p.h. Three days later the Italian pilot hung up a world's speed record for both land planes and seaplanes by traveling 238.873 m.p.h. over the Schneider Trophy Contest course at Hampton Roads, Va. Thus for the first time since the beginning of flight the land plane had to retire to the background when a searles was in the matter of speed.

And then came the year of 1937, the greatest year in aeronautical history as regards the accomplish-



The 1937 Schneider Trophy contest winning Supermarine Napier S-5

ment of airplanes and searles. The great year during which the realization of the true value of the most modern means of transportation took root in the public's mind. The year which came to be called to all those who had sacrificed so much that aviation might carry on. Indeed, a year of dreams come true!

The first event was the start from Capetown, Swaziland, on February 13, of a 25,000 mi., four continent flight by Commander DePinedo in a Savoia flyingboat. Commander DePinedo crossed the South Atlantic by searles to South America, then carried on up into the United States, where a most unfortunate accident resulted in the loss of his plane. Then with a new flyingboat up to Newfoundland, down to the Azores and on to Orin, where he was welcomed by Mussolini on June 16.

Next came the capturing of the world's endurance record by Clarence D. Chamberlin and Bert Acosta in the Whirlwind powered Balloua monoplane "Colombia." On April 12 Chamberlin and Acosta took off from Roosevelt Field, L. I., and on April 14 they landed again with a new world's record of 51 hr. 11 min. 26 sec. in their circle.

On May 2 four Pan American Landing Amphibians re-



The start of the Mulholland-Hogenberger non-stop flight to the Hawaiian Islands



Commander de Pinedo's flyingboat riding anchor on Buenos Harbor.

named to Belling Field, Washington, D. C., and the end of a 20,500 mi. good-will flight through Central and South America and the West Indies. The flight was under the command of Maj. H. A. Dwyer and began from San Antonio, Tex., on Dec. 30, 1933.

Exactly eight days after the return of Major Dwyer's flight of planes a young pilot, little known outside of the aircraft service, and named Charles A. Lindbergh, made a 14 hr. 55 min., open trip, flight from San Diego, Calif., to Roosevelt Field, L. I. The plane that he flew was a Whirlwind powered Ryan monoplane named the "Spirit of St. Louis." Upon his arrival the young pilot began to prepare his plane to attempt a solo non-stop flight to Paris, France, and the 23,500 Orling prize.

It is quite probable that those who do not know a man or woman in the civilized world (but does not know the result of that attempt by Charles A. Lindbergh. For the sake of the record, the start was made from Roosevelt Field in the early dawn of May 20, and 12 hr. 29 min. 30 sec. later a landing was made at Le Bourget Field, north of Paris. The distance traveled was 3,610 mi. and the average speed made during the non-stop trip was 398 m.p.h.

The second nonstop crossing of the North Atlantic was accomplished on June 5 when Clarence D. Chamberlin, with Charles A. Levine as passenger, landed the endurance record breaking "Colombia" at Heli, Germany, after a 3,915 mi. non-stop flight from Roosevelt Field. The time taken for that great flight was 43 hr. In making the flight Chamberlin's established a new world's non-stop distance record.

The North Atlantic having been crossed twice, the attention of the world was directed to the Pacific. On June 28 First Lieut. D. Mulholland and Lt. H. Hogenberger took off from the Oakland Airport, California, in a three Whirlwind engined Fokker Army transport monoplane. Twenty-five hours and fifteen minutes later they landed at Wheeler Field, Oahu, Hawaiian Islands. The first searles to successfully link the Mainland and the Islands in a non-stop flight. The airline distance between the two points is 2,400 mi.

On the day that the Army Fokker landed in Hawaii, another Fokker (America) (three Whirlwinds) commanded by Capt. R. E. Byrd, with Ernest Borchers and Bert Acosta as pilots and Lieut. George Neville as radio officer, took off from Roosevelt Field and headed for Paris. After a "helter" flight lasting 46 hr. 15 min. the plane was landed in the water 300 yd. off the shores of Ver-Sor-Mer, France, and 3,477 mi. from the take-off point.

July 4 saw the establishing of a new world's searles altitude record. On that day Lieut. C. C. Chapman took a Navy "Aperio" searles powered with a supercharged "Wasp" engine up to a record height of 27,995 ft. at Anacostia, Washington, D. C. Twenty-one days later

Lieutenant Chapman set a world's altitude record for all types of airplanes when he took the same plane up to 38,474 ft.

The Pacific Coast from California to the Hawaiian Islands was successfully crossed non-stop by air for the second time on July 13 and 14. This time the honor was achieved by two civilian pilots, Ernest L. Smith and Emory B. Thomas. Flying a Travel Air monoplane fitted with a Whirlwind engine they took the plane off the Oakland Airport and flew non-stop to a point 50 mi. southeast of Wheeler Field, their original objective. The



The "Spirit of St. Louis" on its way to Le Bourget Field, Paris, France.

distance flown was 2,348 mi. and the time taken to complete the flight was 23 hr. 35 min.

On July 20 Col. Charles A. Lindbergh began a country-wide tour of the United States under the auspices of the Daniel Guggenheim Foundation for the Promotion of Aeronautics. Flying the famous Spirit of St. Louis, Col. Lindbergh visited each one of the 48 states in the Union and returned to his starting point in New York City on October 23. The total distance traveled in the tour was 20,320 mi. and the total flying time was 260 hr.

The next event of importance took place on the other side of the Atlantic. Flying a Junkers J-35-1 mono-

plane powered with a Junkers engine, two German pilots, Camille Edzard and Johann Richter took off from Germany on August 3 and remained aloft for 32 hr. 33 min. 3 sec., a new world's endurance record. Two other Junkers flights were made during the month of August. As an entire of fact, it was three German flights.

The first was a 36 hr. 17 min. 31 sec. non-stop flight from Oakland Airport, California, to Winkley Field, Hawaii, on August 16 and 17 by Arthur C. Gorchel and Louis W. V. Davis in a Whitford powered Travel Air monoplane. By making that flight the pair was first place in the Daily Derby. The second famous flight was the flying of the same route on the same days by Martin Jensen and Paul Schuler in a Whitford Bessie monoplane. The time was 38 hr. 16 min. and the lower ground was second place in the Daily Derby.

The third famous flight was an attempt by Edward F. Schuler and William S. Brock to establish a new "round the world" record in a Swiss monoplane (Pride of Devon) fitted with a Whitford. After flying the North Atlantic non-stop and continuing on to Tokyo, Japan, well ahead of the schedule, the three observed the attempt due to public opinion regarding their plan to fly the Pacific. The flight was begun from Hanoi, Indochina, on August 27 and by the time they decided to give up the trip, 38 days later, Brock and Schuler had traveled 13,295 mi. in 44 hr. 35 min. flying time.

The 1927 Schneider Trophy Contest was the next event to bring forth a new airplane record. Privately a Supermarine Midge S-5, Flight Leader S. W. Wilson, R. A. F. covered the course in Venice, Italy, on September 23 at an average speed of 281.488 m.p.h. That speed mark constituted a new world's record for all types of planes.

Haldeman vs. Forest Doss

Another attempt to cross the North Atlantic non-stop by air during 1929 was begun on October 12. While the flight was not successful in regards reaching the other side of the ocean, a new non-stop over-water flight record was made. Thereupon, a retelling of the details of the flight is not out of place in this article. The personnel of the flight consisted of George Haldeman, pilot, and Miss Ruth Elster, passenger. The plane used was a Swiss monoplane powered with a Whitford, and the distance traveled from the point of the take-off, Roosevelt Field, to the spot where the plane was forced down onto the water, 339 mi. northwest of the Azores, was 2,623 mi.

On the same day that Haldeman took his plane off the

Roosevelt Field runway, Lieutenant Coville and Le Bree took off from Paris, France, at the start of a 33,000 mi. aerial voyage that was completed at the starting point on April 14, 1928. The plane used by the two German French long distance pilots was the 450 hp. Hispano powered Brigant XIX, which when Lieutenant Coville was on his record landing, Paris-Duack flight in 1926. The route followed by the United States was exactly the same as that down by Commander DePerdue, with the exception that the French airmen followed the east coast of the U. S. up to New York City. Then the pair flew across the continent and around the Pacific by land, and then crossed on to Paris. The total number of flying hours during the trip was 138.

A New World's Speed Record

For the second time during the year of 1927, a new world's speed record for all types of airplanes was established on November 4. This day it was the well known Italian speed artist, Maj. Mario de Bressendor, who being up the new figures. Flying a Fiat powered Misto 35-52 racing monoplane, Major de Bressendor made a speed of 289.616 m.p.h. over the Schneider Trophy Contest course at Venice, Italy.

The last great flight of this great year was made by the most famous of all pilots of present times, Col. Charles A. Lindbergh. On December 13, Colonel Lindbergh took off from Hilling Field, Washington, D. C. in the Spirit of St. Louis and flew non-stop to Madison City, Minnesota, a distance of 2,000 mi. in 32 hr. 41 min. That flight was the beginning of a 9,000 mi. good-will tour through Central America which was completed at St. Louis, Mo., on Feb. 13, 1928. During the tour Colonel Lindbergh made 16 stops and spent 116 hr. 30 min. in the air.

The first aerial achievement of 1928, the 25th year of flight, was a solo flight by an English pilot, Harold "Berf" Hildes, in an 80 hp. German powered Avia "Avia" plane from Croydon Airport, London, England, to Port Darwin, Australia, in a flying time of 134 hr. The first was made on February 7 and the 12,000 mi. trip was completed on February 27. The average speed throughout the flight was between 90 and 100 m.p.h.

March 20 was a day on which two different world's records were established. The first was a new endurance mark of 83 hr. 36 min. 30 sec. set up by Edward Stenhus and George Haldeman in a Swiss monoplane with a

Whitford engine. The flight was made at Jacksonville, Fla., and the time held by the 13 man 75 hp. better than the old record held by the German pilots Edzard and Richter.

The second new record was one for speed, and was made by Major de Bressendor in his Fiat-Misto racer over the Schneider Trophy Contest course at Venice. The new speed record was 338.624 m.p.h., an increase of about 21 m.p.h. over the previous mark made by the same pilot in the same plane and at the same place.

The East-West Atlantic Crossing

Then came the first successful east-west crossing of the North Atlantic by a heavier-than-air craft. On April 13 Capt. Herman Goebel, a German, Baron Guther von Huenefeld, also a German, and Capt. James Fitzmaurice, an Irishman, took off from Baldovick Airfield, Dublin, Ireland, in a 340 hp. Junkers powered Ju-5 transport plane (Düssau). About 37 hr. later the plane was forced down on the key waters of Grosvenor Island in South of Belle Isle, between Newfoundland and the lower coast of Labrador. The aerial distance between these two points is 3,225 mi.

The 3788 airplane conquest of the North Pole region was accomplished on April 15 and 16. Flying a Wasp powered Lockheed monoplane, Capt. George H. Wilkins and Lieut. Carl B. Bickler went non-stop from Port Barrow, Alaska, to Dead Man's Island, 25 mi. north of Green Harbor, Spitzbergen. The distance traveled was 2,200 mi. and the time was 20 hr. 30 min. Five days later the plane was down in Spitzbergen.

May 11 marked the beginning of the greatest long distance flight yet attempted and accomplished. Using a three Whitford powered Fokker monoplane (Southern Cross) Capt. Charles Kingsford-Smith, Charles T. F. Ulin, Lieut. "Harry" W. Lyons, and James Warner, left from Oakland Airport, California, to Melbourne, Australia, in a series of five flights, three of which were over water. The first, Oakland Airport to Hawaii, a distance of 2,600 mi., was made in 27 hr. 28 min. The second, Hawaii to the Fiji Islands, a distance of 3,118 mi., was made in 34 hr. 33 min. That flight established a new world's record for non-stop over-water flight. The third flight, Fiji Islands to Swireland, Australia, a distance of 1,512 mi., was made in 21 hr. 18 min. The fourth flight, Swireland to Sydney, a distance of 305 mi., and the last leg was to Melbourne and the end of a 7,600 mi. air voyage across the Pacific waters.

Endless Set Endurance Record

The world's endurance record was past to receive notable attention. On June 2, Maj. Arturo Ferranti and Gen. P. del Pico, Italian pilots, took up a 500 hp. Fiat, powered Sava-Marchetti S-64 monoplane from Rome, Italy, and stayed aloft until they had beened by five hours the old endurance record, set by Stenhus and Haldeman. The exact time of the flight was 58 hr. 37 min.

The first 1928 west-west crossing of the North Atlantic, was undoubtedly the first non-stop crossing, also way by a member of the fleet was, was accomplished on June 17 and 18. Flying a three Whitford engine Fokker monoplane (Friedwing) Wilbur Stalla, pilot, Louis Gordon, mechanic and co-pilot, and Miss Amelia Earhart, passenger, went from Tapanapa, N. I. to Barry Port, South Wales, England in 30 hr. 40 min.

Having surpassed the world's endurance record, Major Ferranti and Commander del Pico proceeded to set a new world's non-stop distance record on July 5. Using

the same plane that stayed aloft longer than any other plane in the world, the two Italian airmen took off from Monrovia Airport, near Rome, Italy, and flew non-stop to Port Natal, Brazil, a distance of 4,675 mi. in 50 hr. 07 min.

Two days later, however, they had their endurance record in the German pilots, Hans and Zimmern who stayed aloft in a Junkers powered Junkers monoplane for 65 hr. 31 min. The flight was made over Denmark, Germany, and the difference in time between the old and the new record (not broken to date) is 6 hr. 43 min.

July 22 saw the start of a successful attempt to lower the record of the World record by Capt. C. B. D. Collyer and John H. Mears. The plane used was a Fairchild Cabin Monoplane (City of New York), powered with a Wasp engine. The new time mark established was 20 hr. 12 min. Of the total 19,725 mi. traveled, 13,790 mi. were traveled by air.

The transatlantic non-stop record of 36 hr. 50 min. established by Lieutenant Mearns and Kelly May 23, 1923 was reduced to 18 hr. 58 min. on August 30, 1923 by Carl Arthur Gabel with Harry Tucker, as passenger.



Brock (left) and Schuler in front of their famous Swiss monoplane "Pride of Devon."

in a Wasp engine Lockheed monoplane (Vindicator). It should be noted here however that Mearns and Kelly flew from the east coast to the west coast, whereas Gabel and Tucker made their first time on a west-east flight. However, it was just a matter of a little over two months (October 25) when Captain Collyer, with Tucker as a passenger, flew the Yankee Doodle from New York to Los Angeles in 24 hr. 31 min., a matter of 1 hr. 59 min. less than the time of the 1923 east-west trip.

The last noteworthy airplane performance of 1928 (that is, up to the time that this man goes to press) was the setting of a high speed mark of 210.57 m.p.h. on November 4. The speed was witnessed by Superintendent Nye S-3, fitted with a Napier "Lion" engine, and piloted by Flight Lt. J. A. Gray, over a course at Calicut, England. As the speed was only 96 m.p.h. faster than the existing world's record it could not be recorded in a new world's speed record, as, according to the rules, there must be an increase of at least five miles per hour over the existing record. On the day before Flight Lieutenant Gray went 319.57 m.p.h. under official observation, he had been clocked in 245 m.p.h. by unofficial means.

What records will be made in the year of 1929 is a matter for speculation. However, it might not be some to predict that the speed record will be increased to around 250 m.p.h., the altitude record to over 30,000 ft., the endurance record to about 75 hr., and the non-stop distance mark to well over 5,000 mi.



Captain Kingsford-Smith's U. S. in Australia three Whitford powered Fokker monoplane "Southern Cross."

Twenty-Five Years of Airplane Design

By CAPT. H. C. RICHARDSON, (CC) U.S.N.

BROADLY speaking, design of aircraft covers aerodynamics and structural considerations, but still more broadly it involves power plant and equipment, for these latter have had an important bearing on advances in design.

Prior to the first successful flight of a power driven man carrying plane, Lilienthal, Chanute, the Wright Brothers and Montgomery had made some progress with glider experiments. Langley used the whirling arm to gain data on flat plates and later curved plates, but although he used this later data in constructing his power driven models, this data has never been published except in relation to the models and the full sized, power-driven plane. Lilienthal's data was not extensive and some of it was incorrect. It was because of this that the Wright Brothers were forced to the use of a wind tunnel which supplied them with the necessary data, not only for their plane, but for their propeller design, but this data has not been published.

It was not until 1901, with the publication of Eiffel's "The Resistance of the Air and Aviation," that aerodynamic data as to wings and structural features became available in usable form, and individual designers relied on their own data in the development of airfoils and controls. Developments to this stage may be said to rest largely on cut and try methods, so that except for the



A Wright biplane undergoing U. S. Army tests at Ft. Myer, Va., in 1908.

very in England, the wind tunnels at the Navy Yard, Washington, D. C., M. I. T., Lehigh, Stanford, and finally the National Advisory Commission, Langley Memorial Laboratory, and the Bureau of Standards.

Today data is available on hundreds of airfoils, and on streamline forms of struts, cordons, fuselages, and other forms more or less streamlined; to reports, notes, memoranda, annual reports and many new books on design. Today the characteristics of airfoils, streamline forms and propellers, covering and a multiplicity of details is at hand and the data available is being augmented daily.

Quality under all conditions of flight has been studied and is still the subject of constant investigation by the world's foremost engineers. The classical work of Biplan was the first to be published.

Wind tunnel work has been conducted with full size experiments, the most important contribution to date have been the pressure tunnel at Langley Field and the 20 ft. tunnel at the same place. High velocity tests at the Bureau of Standards have aided materially in the determination of flow at and above the speed of sound which was encountered in propeller design.

Powell's corrections for wall interference in tunnels and the recognition of the importance of Reynolds' numbers as affecting the scaling up of model tests to full size conditions have enabled the employment of wind tunnels in the prediction of full scale performance to a satisfactory degree.

Theories of air flow about airfoils have advanced to the stage where theory and model results are in close agree-

ment. The effects of the boundary layer are being better understood.

High speed motion pictures have revealed a confirmation of important theories, a classical demonstration being that of Kutta's theory of Japan.

All the great nations of the world are now applying their material resources to research of aerodynamic features. Today one of the most baffling problems is one of autostratocraft as presented in the uncontrolled and in-



A Wright "Corsair" airplane powered with a Pratt & Whitney "Wasp" engine.

some measure, uncontrollable spinning of aircraft after entering privileged space.

Important in design is the order of the tips. It involves the utilization of the most efficient airfoils, and the suppression of parasite resistance. It has become possible through the advances in structure and power plant design, and the development in structural materials.

With the constantly increasing demands for military performance, controllability and maneuverability have advanced to a remarkable degree, along with refinement in design.

Commercial development has benefited by the military development, but has other criteria than those for military craft. The new demands are bringing development as close as possible to commercial craft, but in terms of material interest is the improvement in military type. The sudden increase in volume of commercial development in itself has broadened the field of development, has opened sources for experimentation and is providing a smaller laboratory for full scale proof of material and equipment. It is largely the difference between military and commercial demands, that has led to the general popular demand for the monoplane in preference to the biplane.

The greatest incentive to refinement of design has been the development of racing planes, and in these it is found that substantially equal results are obtainable with either the monoplane or the biplane arrangements. The Pulitzer Trophy Race and the Schneider Cup Race have been responsible for this development, and, appearing as it may seem today, the speed has been met with the airplane.

These races have furnished the incentive for research research which has undoubtedly had an important influence on the improvement of aerodynamic, structural and power plant development, the results of which are clearly reflected in commercial designs.

Airfoils have passed from an efficiency at 16 to 1, ratio of L/D to well into the 20's; struts have improved from 15% to a 20% ratio of the plate drag to section drag.

Propellers have passed from the stage where the cone was fully exposed to the wind blast and drag, to streamline forms having only 1/10 the drag of a flat plate hav-

ing the area of the maximum section. The overall efficiency of propellers has thus risen 6 to 10 better than 11.

Propeller efficiency of the geared Wright propellers was outstanding for years and attests the thoroughness of the Wright Brothers as research engineers and designers. For three days and five more days thereafter a propeller efficiency of 78 per cent was obtained. Today in motors efficiencies of 85 per cent have been attained.

Thin wing, double cambered, thin wing, equal cambered wing, each has merits for particular designs. Flaps, slots, spacers, swelling wings, wings of variable camber, variable area, wash out, wash in, outer back, dihedral, reflexed, wings tapered to thickness or plan or both all have their advantages for special purposes. The whole current of lightness, monoplane, triplane, multiplane, sesquiplane, and tandem plane, has been played from end to end. Front controls, rear controls, biplane and rear controls, and tandem types have had their vogue. Of the latter, Dornier was the original in 1912 and 1913's Pictorial, 1926, it is the latest.

Helicopters have been constant favorites with never a real success. Strouhal, DeLohme, Berliner, Picarra, Oelrichsen and Kermess, and many others have succeeded in flight of autogiro design on various forms. The autogiro is now in this type of flight has been with the Curtiss Autogiro, which is sure a revolving wing that a helicopter.

Let us now turn to structures. The lightness of structure has been an incessant demand. This demand and the resulting wing covered undoubtedly had much to do with the Wright selection of the light structure, in which it is indicated Chanute was an advocate.

Sack and Dewar describe the early structures, and this type survived until only recently. Spruce and bamboo were early favorites for spars and struts and a variety of woods. Wing covering passed from cotton and linen cloth to milled fabric, rayon, plywood and metal. In some cases in the early days the cloth was nailed or tacked



Aerial view of the Curtiss Autogiro which was recently flown from London to Paris.

to the top surface of ribs and spars only, leaving them exposed to air flow. Wires have changed from hand made wire to steel and now streamlined wire in almost universal usage, exposed to air flow. The light spars were constructed. Panel construction was contemporaneous.

As soon as engineers entered design the continuous spar became more general. Bentled spars, and built up box spars brought with them a new development in local factors in an element of design, and wing spars under combined compression and bending loads led to refinement of design, and research best exemplified in the work of



Front quarter view of the "Hudson Flyer", one of the early types of Corsair planes.

Wright Brothers and the Aerial Experiment Association of Cordell Bell, Curtiss, Schneider and Ballou, origin was more or less haphazard until 1905's data was made public.

From this point on advances were rapid. Data became available from Goettingen, the National Physical Labora-

Twenty - Five Years of Engine Design

By I. H. GEISSER

Next Aircraft Features Philadelphia, Pa.

THE development of the aviation engine from a "delicate" piece of mechanism weighing 10 lb per hp to the "robust" mechanism weighing only 1½ lb per hp is noteworthy mainly by the absence of any radical change in either form or operation. The engines of today are not far different from the first engines to take to the air.

The first engine to accomplish successfully powered flight in heavier-than-air machines was the Wright brothers' four-cylinder in-line water-cooled engine. Although it might be expected that the specifications of this engine should be accurately set down as of major importance in the history of aviation, authors differ considerably in their description of it. I have before me two books and two articles, all by prominent authors, and their specifications of the engine are as follows:

Wright Brothers' First Engine

S/NP (0/7)	R.E.M. (0/1)	Flow (4/1)	Stroke (4)	Depth (10)	Width (10)	D ₁ (1/1)		D ₂ (1/1)		D ₃ (1/1)		D ₄ (1/1)
						D ₁ (1/1)	D ₂ (1/1)	D ₃ (1/1)	D ₄ (1/1)			
0	0	4.0	4	10	10	1/1	1/1	1/1	1/1	1/1	1/1	
1	1	4.0	4	10	10	1/1	1/1	1/1	1/1	1/1	1/1	
2	2	4.0	4	10	10	1/1	1/1	1/1	1/1	1/1	1/1	
3	3	4.0	4	10	10	1/1	1/1	1/1	1/1	1/1	1/1	
4	4	4.0	4	10	10	1/1	1/1	1/1	1/1	1/1	1/1	
5	5	4.0	4	10	10	1/1	1/1	1/1	1/1	1/1	1/1	
6	6	4.0	4	10	10	1/1	1/1	1/1	1/1	1/1	1/1	
7	7	4.0	4	10	10	1/1	1/1	1/1	1/1	1/1	1/1	

The contemporary of this engine should also go down in history as an achievement years ahead of its time. This was the Mundy engine designed by C. H. Mundy for the

The engine was built in 1932 and is claimed to have successfully passed a 30 hr full throttle test. The weight of this engine at 30 per cent displacement is considerable and has seldom, if ever, been bettered in any form. Its weight at 15 per hp was less than the average of all types in 1932—30 yr later. It is in the Smithsonian

A 16-cylinder 134 hp, steam cooled Vee type *Automotive*
engine built in 1902

Museum in Washington and present day engineers might well say it's a visit.

In the succeeding years to 1910, development went ahead (at leastward) judged by the Mundy engine), with no very definite trend. In 1912, there were more than 20 manufacturers of aviation engines and there were 70 models listed. There were air-cooled radials, water-cooled radials, water and air cooled "V" and vertical engines, and air-cooled rotaries. The average power was about 55, and the average speed about 1200 r.p.m. Among these engines was the second aviation engine that deserves a place in aviation history as the first of significance. It was the 100-hp. 12-cylinder engine of French origin, with a 16-cylinder "V" type, having liquid fuel distribution, and three cooling, two features now being given considerable attention. The principal characteristics of the engine were:

Baruch A. Osherson—1940

Year	Age	Sex	Length	Weight	Wing	Tail	Bill	Culmen	Midt. toe	Max. depth
1968	100	♂	112	80	88	117	17	100	108	19

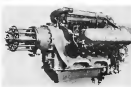
In the next four years, the number of manufacturers increased to 75 and the number of models to 160. There was still an definite trend of development with the possible exception of the increase in the relative number of

rotary engines, this type being exceeded in number of models offered only by the vertical in-line engines. The average horsepower, displacement, and speed were greater than in 1981.

With the advent of the World War the normal development was entirely upset. The necessity of getting planes to the front as rapidly as possible intensely tried to cause concentration on those types which appeared to offer the least number of obstacles in development. The experience with automobile engines undoubtedly had its influence in the concentration of effort at the start on water cooled types in preference to air cooled, with the exception of the rotary engines. None of the engines settled on for the Army or Navy were of the air cooled type. The German engine industry, had apparently decided on the air-cooled water cooled and conventional types. Their efforts are less true with wonderful standards.

Due to the fact that in 1994 the rotary engine was considerably lighter (50 per kg) than any of the other types, it predominated in the Alouette machines of the 1970s. The limitations of that type were reduced, however, and the stationary cylinder types were rapidly developed and soon reached the point when their performance exceeded that of the rotaries. The demand was constantly for greater powers. The 90 and 100 hp rotaries at the start of the war had given way to 220 and 300 hp engines when we joined the Allies and the end of hostilities found units of 900 to 1,000 hp under development.

Profound interest in this development during the war was the 12 cylinder water cooled "V" and the weight per horse power of this type was brought down to 2.18. Most designs of this type having three or four banks of cylinders were developed to give equal performance, but the number of frames constructing these types was limited. The English viewed the possibilities inherent in the six-cylinder radial engine and, at about the time of our entry into development, was pushed by this government. At the same time C. J. Lawrence was starting the work in the



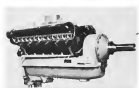
Front quarter view of a 530 hp Napier "Lion" Series
31 motor cooled engine.

country which led up to the present Wright "Whisper" engine. In Pease, the development of the Astute engine was completed.

Subsequent to the War, the trend toward the air-cooled radial engine persisted. It was seen as less an uphill fight for the adherents of this type of engine and many of the leading engineers went, one might say, violently against it. Those who have been associated with the industry since the War will undoubtedly recall that quite a number of engineers, who are now among the pillars of the air-cooled engine and broadening its many applications, were not at low-brow deriving it with some

vehement. There were, therefore, a number of very successful water cooled developments before the general race to the air cooled standard set in, and there are still a number of extremely successful boilers who have not yet deserted the type which helped so greatly in the winning of the War. It is quite possible that these come well

As stated in the first paragraph, the entire development of the station engine has been devoid of radical changes. The improvement accomplished in weight per horse power has been accomplished in three ways, first, by de-

A 600 hp. Curtiss geared "Cougarr" motor
 used engine.

violation of better materials; second, by increasing the mean effective pressure; and third, by better disposition of the material. The improvement in endurance can be attributed partly to the first and last items mentioned above, but the greatest factor has been the training of the reflector.

Though these disorders is the order based, material comes first and might so. It is probably the greatest loss of weight. The weakness is strength of materials per pound of weight has been utilized mostly to withstand the increased pressure. This is clearly emphasized by the figures in Table I giving weights per cu in. in displacement for the past 18 yr. These figures are not averages, but are taken from successful segments of each period. They cannot be said to be representative of the period. The purpose of the summary of design is to see that the sample figure was representative of the others. However, the figures do show that successful designs of today weigh just as much or even less than their predecessors in lb per cu in. in displacement. The table is also of interest in showing the relative weights per cu in. of the various

Table I.
Weight Displacement Ratio
lb. Per Cu. In.

	1978	1979	1980	1981	1979
Expend	60	48	58	44	56
Income	49	32	33	27	—
Pop. 100,000	48	50	67	33	60
State	60	13	35	33	—

Table II shows a more definite advance but again it will be noted that the increase in speed is not uniform. This is characteristic of all of the trials and is due to the non-uniformity of drugs previously mentioned. The increase in speed with the osseous increase in mass effective pressure was made possible mainly by the improvement of materials but, undoubtedly, the third factor of better disposition of material aided. It is interesting to note that the speed of the rotaries did not keep pace with the other types and this is partly responsible for

ther device. The centrifugal force stresses limited the speed of this type.

Table II.

Speed in R.P.M.

	1450	1500	1550	1600	1650
Radial	1000	1000	1000	1000	1000
Engine	1000	1000	1000	1000	1000
Prop.	1000	1000	1000	1000	1000
Power	1000	1000	1000	1000	1000

The second factor, higher mean effective pressures, is shown in Table III. The increases shown were accomplished by improvements in volumetric efficiency and increase in compression ratio. The former was attained by



Front quarter view of a 600 hp 12-cylinder Curtiss "Chief" inverted engine.

improvements in valving and by increasing the valve diameters. The increase in compression ratio was made possible by improvements in combustion chamber shape and cylinder cooling. The inability to secure adequate cylinder cooling in the air cooled engines held them back for some time as well as noted in the data for 1922, but the present types are now able to hold their own with their water cooled contemporaries. The improvement in mean effective pressures is even greater than is indicated by Table III, as these increases were attained in the face of increasing speeds.

Table III.
Mean Effective Pressures
Lb./Sq. In.

	1914	1917	1918	1920
Radial	100	100	100	100
Engine	100	100	100	100
Prop.	100	100	100	100
Power	100	100	100	100

The results of the increases in speeds and mean effective pressures are shown best in the values of power per cu. in. displacement shown in Table IV. In view of the fact that there was little decrease in weight per cu. in. displacement, the dramatic increase in horsepower shown in Table V was only accomplished by the increased cylinder performance. It will be noted that the particular air cooled radial and water cooled "V" engines chosen for 1920 show better cylinder performance for the water cooled engine, but that this is exactly offset by the lower weight displacement ratio of the radial.

Table IV.
Power Displacement Ratio
B.H.P./Cu. In.

	1914	1917	1918	1920
Radial	100	100	100	100
Engine	100	100	100	100
Prop.	100	100	100	100
Power	100	100	100	100

Table V.
Weight Power Ratio
Lb./H.P.

	1914	1917	1918	1920
Radial	100	100	100	100
Engine	100	100	100	100
Prop.	100	100	100	100
Power	100	100	100	100

The advances due to better distribution of metal can not well be gauged, and it is only a personal opinion that the magnitude of this gain is relatively small. Undoubtedly, our knowledge of stresses has been increased, mainly by failures, and we have profited thereby. However, it must not be forgotten that the general form of our present engines does not differ from those of previous years. The radial probably offers the best opportunity for concentrated distribution of metal and it should be recalled that one of the first two engines, the Waco, was a radial and weighed but 2.6 lb. per hp, with the low mean effective pressure of 80 lb. per sq. in. and the low speed of 950 r.p.m.

There is one additional factor in the accomplishment of decrease in specific weight, which I have not mentioned directly, but which deserves attention. That is the gradual increase in unit power that has occurred.



Front quarter view of a Pratt & Whitney Series D 400 hp engine.

From an average of about 35 hp. in 1910 we now have an average of about 400 hp. (This is for military engines. I have not included commercial engines in any of this survey due to their comparatively recent advent.) The proportion of the weight decrease that can be ascribed to this increase in unit power is difficult to estimate and is probably generally over rather than under. Instances of increase in specific weight with increase in unit power are not uncommon.

Of the factors influencing the endurance of the engine, by far the most important is the very great change that has been accomplished in the handling of the engine in the air. Part of this is due to the better plane performance that permits of safe flying at much less than the maximum power available. The rest is due to the better understanding of the engine on the part of the pilots. Even as recently as the period at the end of the



Front quarter view of a 250 hp Wright "Whitcomb" engine.

War, it was very difficult to get the pilots to see direction in their manipulation of the throttle. It seemed that they just had to open the throttle with a bang and close it in the same way. And the air fuel power seemed to be essential. The records that are now being made are being made with the engine throttled to 75 per cent. of its maximum power, or less, and the throttle is being manipulated with the utmost care. Although I do not have figures available on which to base an estimate, nevertheless I venture to say that the records now being made would be cut to one half, or less, if the engine were subjected to the severe service characteristics of the war period.

Credit to Engineers

All of the credit, however, does not belong to the pilot, or the ground service. The engineers have done their share in making possible 300, 400, or even 500 hp. between overhauls in contrast to the 10 hp., 25 hp., and 30 hp. periods necessitated in war days. I have in mind one war model, which during the War required a top overhaul after the first 20 hr. of service. This engine was developed to the point where it succeeded in running 250 hp. at full throttle without a major failure in 1000 hours. That war engine, however, also been subjected to, and was passed successfully, extensive tests at full throttle for periods of over 100 hr.

In several places I have stated that there have been no radical advances in the development of the past 25 years. Undoubtedly, there will be some who may take exception

to this with the knowledge of some special types. It is advisable, therefore, to mention that turbines of one sort or another, radial engines, and gas engines have been with us throughout almost this entire period. However, there is one exception and one that I confidently expect to be the greatest single step forward.

During this year the Packard Motor Co. has announced its entry into the field of auto-gasoline aviation engines under the able leadership of Capt. L. M. Woolson. On the West Coast, the Ramo Company has been formed and will be guided by an engineer formerly qualified by experience for this task, L. W. Griffin. A number of other reputable concerns, some of them constructors of heavier Diesel engines, have entered the field. In England, the Beardmore oil engine is being developed for the new design, and cannot but fit the Bristol Company has under way an air cooled radial oil engine.

History to Be Depicted

The history of the air cooled engine, in my opinion, is going to be depicted, but with even more astounding results. The air cooled engine was known before its entry into aviation and at the start was not particularly successful. Insurmountable obstacles were seen by transient engineers. Automobile experience was arrayed in the battle front. This view was at other times insurmountable obstacles either disappeared, or were surmounted. The Diesel engine has been known for years. Automobile experience can again be said to be being surmounted to small its appearance in the aviation industry. Even Diesel engineers say it cannot be done. Many have



A 24 cylinder 1250 hp Packard "N" water cooled engine.

said that the ratio of mean effective pressure to maximum pressure is too low in comparison to the Otto cycle. This statement has already been refuted. For equal efficiencies the Otto can be made better for the Diesel than for the Otto cycle. And finally, a thought worth much consideration, the Diesel engine can and is being successfully used in two-stroke cycles.

This is the first and only recent development in all of the 25 years of aviation. Let us all welcome it and give it the encouragement that it deserves, but has not received.

The Original Wright Biplane

By LESLIE E. NEVILLE

THIS first successful engine propelled airplane, flown by Orville and Wilbur Wright, on December 17, 1903, was a development of the Wright glider of 1902 and the result of a long series of experiments in aerodynamics and thousands of gliding flights. Several structural details of the 1902 glider were modified, however, in the power driven machine, to produce a stronger plane and to provide mounting for the engine. During the five years following the first flight, no fundamental changes were made in the original airplane and as a result, the Fort Meyer machine, built in 1908, bore a striking resemblance to the historic airplane. Unfortunately, the original plane was seriously damaged by a strong wind on the day of the first flight making it necessary to suspend experiments for that year.

The original Wright "Flyer," as it was called by the inventors, was a modified biplane glider of the guller type, having two propellers placed at the rear of the wing structure. A double vertical rudder, also at the rear, was supported on outriggers and a double horizontal rudder or elevator, similarly supported, was located at the front of the machine. Runners or skids were used as the undercarriage to reduce the length of the landing run. Engines, rudder and fuel tank were mounted on the lower wing

sur with their feet braced against a wooden rear pylon ahead and below the leading edge of the wing.

It was decided to place the engine beside the operator, so that it would not fall on him in the event of a dive into the ground. In the case of a landing on wet wing, it was assumed that the crumpling of the wing would send



Airplane picture of a Wright experiment with a glider in 1903

to absorb the shock, and little danger to the operator was expected from this source. To preclude the possibility of rising over in a landing, the runners were extended for a considerable distance in front of the wing structure.

The bottom plane had a wing span of 40 ft., 4 in., a chord of 6 ft., 6 in., and no overall length of 19 ft., 9 in. A gross weight of 580 to 600 lb. was allowed in the design of the first plane, but this was increased to 750 to 800 lb. after the engine was completed and was found to develop greater power than originally expected. In the first flight, which lasted but 12 sec., the speed of the machine relative to the air, was 15 m.p.h. Four flights were made with the airplane, and the longest was of 59 sec. duration. A distance of 853 ft. against a wind of approximately 20 m.p.h. was covered in this flight.

Great difficulty was experienced by the Wright brothers in obtaining a suitable power plant for their machine. After experimenting with a number of gasoline engine manufacturers, the natural combustion engine then being in its infancy, the brothers decided to build their own power plant. After the design work was completed, it required just six weeks to build the engine. This first airplane power plant was a water cooled, four cycle, four cylinder in line vertical type having a bore of 4 in. and a stroke of 4 in., and weighing less than 200 lb. Preliminary block tests on the engine showed that it developed approximately 9 hp. These tests, however, were made

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over periods of one or two minutes at a time with inadequate provision for lubrication. Later it was found that the engine would develop 15 hp. for a few seconds after starting, but that the output dropped rapidly until, at the end of a minute, it was only 12 hp.

Believing it to be desirable to employ a large volume of air so possible and to permit the use of greater pitch, it was decided to use two propellers. Opposite rotation to maintain the gyroscopic effect, was accomplished by means of a double chain drive system in which one chain was crossed and the other used in the normal manner. The first propellers, which were built entirely on the basis of theoretical calculations and without the benefit of previous experience with air screws, were about 85 per cent efficient. This was set off the distributing function to the surface of the plane. In later Wright planes a propeller efficiency of 75 per cent was obtained.

Shaped Solid Propeller Shaft

Also a series of tests with regular propeller shafts, during which several were broken, this idea was abandoned and solid steel shafts of smaller diameter than the broken ones substituted. This was made necessary because of the irregular operation of the engine which had a flywheel too light to protect the transmission system from the sudden shocks resulting from the frequent run firing, or premature explosions. Mounting struts for the propeller shafts were located between the wings. A nut bar at the outer ends of the propeller shafts. This was required to allow the failure of various attempts to prevent the nuts from working loose. The shafts and sprockets were heated and rolled correct was poured on the threads. The nuts were then secured in place and no further difficulty was experienced with them.

The wings were constructed of wood and covered with fabric. Metal fittings were used in assembling the structure. Two spars were used, the forward member car-

rying the leading edge and the rear spar being located approximately two-thirds of the chord distance from the leading edge. Former ribs consisted of two wooden strips about 3/4 by 1/4 in. bent to the contour of the wing and having wooden blocks placed at intervals between them. Solid compression ribs were provided at several points, including the section containing the engine mounting and aileron's position.

The wing curve, which was developed after a long series of wind tunnel tests with various airfoil shapes, was

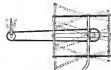


Diagram showing the operation of the flexible rudder and elevator of the original Wright airplane

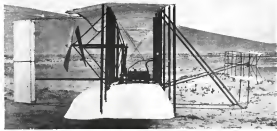
provided with the chord very long in proportion to the span length. This curve was adopted after making tests on a large number of surfaces of different shapes, and measuring effects of air pressure on many standard surfaces at various angles of attack. Wings were built in the form of an arch from tip to tip to ensure lateral stability.

To control lateral stability a device was provided for warping the outer portions of the tip sections in such a way as to vary the camber at the tips. In the original plane, the warp and rudder action was controlled by a horizontal control lever which when moved laterally deformed the warp and when moved in a fore and aft direction controlled the rudder. A diagonal strut of



Type of line used by the Wright brothers in their early experiments in controlled flight.

at the right of the longitudinal center line so as to balance the weight of the operator on the left. In the original plane the operator lay face downward on the wing to decrease wind resistance, but this feature was changed in the later Wright planes and provision was made for pilot's and passenger's seats on the wing, so that the occupants



Side view of the Wright Biplane, the first successful heavier-than-air craft

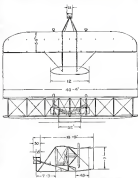
the lower moved both rubber and warp simultaneously, producing a squarish control effect. This combined action of rubber and warp was the subject of a basic patent obtained by the Wright brothers. The horizontal rubber, or elevator, was controlled by a separate lever. Vertical aerodynamic struts and diagonal stays were used in the external bracing. The struts were attached by metal fittings to the wing spars and rigid wire bracing was used between all the forward struts. This bracing was triangulated between the rear struts of the control bay. The rear struts of the two outer bays were not rigidly braced, but were held in position by means of the movable wires used to control the warp. These wires passed over pulleys and the system was so designed that opposite warping was obtained on opposite sides, as in the case of the aircraft in present-day plants.

Double Vertical Rudder Unit

The double vertical rudder was placed 4 ft. behind the trailing edge of the wing and mounted on pivots between the two 100-lb. stippled outriggers, one at the top and the other at the bottom. The rudders were both 7 ft. high and 2 ft. wide, and were placed 2 ft. apart. They were rectangular in shape, constructed of wood and covered with linen. Similar construction was used in the horizontal rudders, or elevators, which also were double and pivoted to their mounting members at a line 7 ft., 3 in. in front of the leading edge of the wings. The elevators had a span of 12 ft. and a chord of 2 ft., 6 in., constant throughout the greater portion of the span and tapering to zero at the pointed tips. The elevators were mounted on two members formed by bending the leading rudders to a vertical position. The rudders were braced near the head by two struts attached to the leading edge of the upper wing.

One of the outstanding characteristics of the Wright biplane was the use of double rudders and elevators. It was this that made possible to prevent swished instead of

One of the interesting features of the Wright biplanes was the manner in which they were launched. The use of landing runners made it impossible for the plane to take-off from the ground even if the engine had developed sufficient power, which of course it did not. In order to attain flying speed the airplane was placed on a monorail



Three view drawing of the original Wright biplane.

track consisting of a series of planks placed on edge and having a thin steel rail. The plane was placed on a small car on the track and a cable from the car attached to a pulley which was released from the top of a small portable tower when the plane was ready to start. The falling weight imparted sufficient velocity to the plane to enable it to attain flying speed when it reached the end of the rail. It was not until a number of years after the first flight at Kitty Hawk that wheels were substituted for the runners on the Wright airplanes.

The specifications of the first Wright biplane are as follows:

Wing span	43 ft., 4 in.
Chord	6 ft., 6 in.
Overall length	19 ft., 9 in.
Approximate height	7 ft.
Wing curve	Parabolic
Span of horizontal elevators	12 ft.
Chord of elevators	2 ft., 6 in.
Height of vertical rudders	7 ft.
Width of vertical rudders	2 ft.
Landing gear track	4 ft., 4 in.
Engine	Four cylinder in line developing 12 hp.
Drive	Two propeller shafts and speeder



An action picture of an early type of Wright biplane in which Walter Wright flew in France during 1908.

flat surfaces to the air against which they were operating. When actuated by their respective control bars, the double rudders and elevators did not merely pivot but were sprung into a curved form. This effect was produced by eccentricity between the pivot points of the surfaces and the pivots of the actuating bar between them. This also was a patented feature in the early Wright biplanes.

Brief Histories of the Development of Companies Exhibiting

at the

INTERNATIONAL AERONAUTICAL EXPOSITION

CHICAGO, ILL.

December 1-9, 1928

A C Spark Plug Co.

A C Spark Plug Co., which was organized in 1908, entered the aeronautical industry some 16 years ago when it first began the manufacture of spark plugs for aviation engines. With the entrance of the United States into the World War and with the resultant increase in the demand for aircraft engines and accessories, the company immediately went into production as its aviation spark plugs. Production of these plugs, which were used extensively in Liberty, Wright and Hispano-Suiza engines, was increased continually throughout the war period, and shortly before the Armistice was signed, the company was producing more than 30,000 plugs a day, according to officials of the firm.

The A C company is now manufacturing radiometers, oil pressure gauges, oil temperature gauges, fuel pumps, anaerobic and instrument board panels, in addition to its line of spark plugs. Production of these instruments, which are supplied to the automobile and motor boat industries, as well as the aeronautical industry, are said to be in excess of 35,000 a day. The complete line of spark plugs and aircraft instruments is on display in the company's exhibit this week at the Chicago aircraft show.

The officers of the company are H. W. de Guiscard, president and general manager; H. H. Corlies, vice-president and assistant general manager; T. H. McDonald, vice-president and W. S. Schwanke, general sales manager. Joseph Zdanovitz is chief engineer and Elmer Babers, chief spark plug development engineer. The headquarters of the concern are located in Flint, Mich.

The Advance Aircraft Co.

The Advance Aircraft Co., manufacturer of Waco airplanes, Troy, O., was organized in 1919, and is one of the oldest makers of commercial aircraft in the United States. It is an outgrowth of the Weaver Aircraft Co., which was operated by "Buck" Weaver, E. J. Jenken, C. J. Brulaker and Nelson Foote for several months before the organization of the Advance company. With the formation of the new company, Mr. Jenken became president; Mr. Brulaker, treasurer; and Mr. Foote, chief.

The more for the line of planes manufactured by this concern was noted by using the initial letters of the words, "Weaver Aircraft," and the abbreviation of the

word "company." With the organization of the Advance Aircraft Co., production of the "Waco" three passenger open cockpit biplane was started. As the demand increased for this model, which is perhaps one of the best known American commercial types, production has been increased. Improvements, however, have been incorporated from time to time. Officials of the company boast that more commercial airplanes have been turned out by its factory than from any other in the United States.

The Advance company is now headed by Mr. Brulaker. With him at the helm are Lee M. Britton, vice president, and L. E. St. John, secretary. The company is exhibiting a complete line of Waco planes at the show.

Aerial Service Corp.

The Aerial Service Corp., manufacturer of Mercury Aircraft, was organized in 1920. The factory is located at Haverhill, N. Y. The officers of the firm are Henry Kleider, president; W. C. Conduaghe, vice-president; H. Y. Rose, secretary-treasurer; H. C. Munnicht, chief engineer and designer, and J. F. Maude, general manager.

The company, in addition to the lighter-than-air equipment it has designed and manufactured for the Army and Navy, has designed and built two different types of mail planes, the "Aerial Mercury" and the "Mercury Jet." It has also designed and built the "Mercury Standard," a five place open cockpit gas engine carrying biplane. The "Mercury Standard" is a three place cabin monoplane, is the latest development of the Aerial Service Corp. This plane is on display in the Coliseum at Chicago.

Aero Guides, Inc.

This company, which manufactures "Aero Guides" as the name implies, is a little less than a year old. It was organized last February with E. B. Boyer as president, C. F. B. Roth, executive vice president, K. M. Bevier, treasurer, and H. T. Parsons, secretary. The headquarters of the firm are located at 24 Franklin St., New York, N. Y.

The company is a subsidiary of DeVier and Co., which



Left to right: J. Don Alexander, president, Alexander Aircraft Corp.; Stephen Hovis, president, American Airplane, Inc.; Hugh M. Uffner, president, Aeromarine Co.

has acted as a single-engineer's representative to the Army, Navy and Marine Corps for the last four years. One of the interesting features concerning the Aero Guides company is the fact that its entire personnel is made up of men who have seen service with the Army and Navy.

The Aero Guides produced by this concern won the highest award at the 1928 National Airway Marketing Conference, held in Wichita, Kan. The company is exhibiting these matters, as well as a model landing field, in its booth.

Aeromarine Klemm Corp.

The Aeromarine Klemm Corp. is one of the newcomers in the aeronautical field. This firm was organized in June of this year. However, Hugh M. Uffner, president of the organization, has been active in the industry since 1908. The company is exhibiting two of its Aeromarine Klemm airplanes at the International Aeronautical Exposition in Chicago.

The executive offices of the Aeromarine Klemm Corp. are located in the Paramount Building, New York, N. Y., while the factory is in Keyport, N. J. Besides Mr. Uffner, the officers of the company are Wm. H. Daughlin, vice-president and general manager, John Gorman, secretary, James Wright, treasurer, and H. Allen Sullivan.

Aeronautical Products Corp.

Aeronautical Products Corp. was organized May 1, 1928, at Singapore, Coon. The firm manufactures the "Scorpion," a four-cylinder, vertical, air-cooled engine. The firm was organized by several engineers for the purpose of building a light, compact air-cooled engine to take the place of the fast-disintegrating surplus of war-time engines.

The concern is located in a modern factory and machinery has been installed, which will allow the production of a great number of such engines.

A "Scorpion" four-in-line, 100 hp. air-cooled engine is attractively displayed at the Aeronautical Products Corp. booth at the Chicago show.

The present officers of the company are H. Alex. Johnson and Harris J. Whitmore, Jr. The offices are at Newgate, Conn.

Aero Supply Manufacturing Co.

G. I. Stath, who has been known in the aero industry since 1922, organized, in 1923, the Aero Supply Manufacturing Co., Inc., for the purpose of manufacturing every sort of aero product used in the construction of aircraft. This company was re-organized in 1925 and moved to its present quarters at College Street, E. J., in January, 1926. All the products manufactured by the company are built to Government specifications, and have now been standardized by many aircraft manufacturers in this country.

The Aero Supply Company is exhibiting at the Chicago show its varied line of aero products and photographs of various planes equipped with these products.

Mr. Stath is president of the company.

Arm-Kraft, Inc.

The Colmar-Arm-Kraft firm exhibited at Chicago, in the product of Aero-Kraft, Inc., a company which was organized on May 25, 1928. Besides Thompson, pioneer exhibition aviator, is sales manager for the company and it is in charge of the booth.

At the present time the firm is doing experimental work at Dayton, O. However, according to a statement issued by the executives, it will locate and go into production at Washington, Pa., the first part of the coming year. Executive offices are at present maintained at Washington, Pa. C. E. MacGraw is president of the concern; J. M. Deal, vice-president; Charles M. Brown, secretary and treasurer, and G. H. Snyder is chief engineer.

Alexander Aircraft Co.

Alexander Aircraft Co., manufacturer of the Alexander Eaglehawk biplanes, was organized in 1925 with Alexander, biplanes, Colo. The original efforts were by J. Don Alexander, president; Don M. Alexander, vice president, and R. A. Duane, secretary-treasurer. Following the organization of the company, production was started on the Alexander light and combination wing Eaglehawk, which were well received.

The continued increase in the demand for the Alexander planes finally constituted an enlargement of the manufacturing facilities of the company. As a result,



Left to right: B. W. de Guiscard, president, A C Spark Plug Co.; C. J. Brulaker, president, Advance Aircraft Corp.; H. C. Munnicht, chief engineer, Aerial Service Corp.

plans were drawn up, contracts were let, and the building for a new factory was erected on a site which had been reserved at Colorado Springs, Colo. The company moved into its new quarters this year.

The Alexander company is now manufacturing the center section Easlerols, a three passenger, open cockpit biplane which is on display at the exhibit of the company.

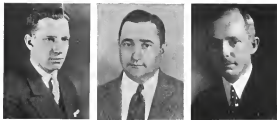
The present officers are the original ones. In addition, however, J. A. McHenry has joined the group of executives as a vice-president in charge of sales. These men are responsible for the introduction of a number of features in the manufacture and merchandising of Alexander planes. One of the most noteworthy accomplishments is the institution of a system for selling the planes on a time basis.

Alexander Company of America

On Sept. 19, 1928, the Pittsburgh Radiation Co. was incorporated by Chas. M. Hall, Alfred B. Hunt and Arthur V. Davis. The firm was organized, as the name implies, to manufacture aluminum and its products. On Jan. 1, 1929, the name was changed from the Pittsburgh Radiation Co. to the Aluminum Co. of America, which change was in strict conformity. The Aluminum Co. of America has been in the aeronautical field ever since aluminum was first used in the construction of aircraft engines and planes and it likewise aluminum in every conceivable form to the aircraft industry today. It now manufactures and handles, among many others, the following products: ceiling, landing frame, sheet aluminum die casting, covering, aluminum, fabricated structural shapes, angles, gasket plates, bronze powder, throttle hand controls, crank pieces, cylinder heads, pistons, connecting rods, valve housings, manifold intake, ignition wire tubes, super charger popovers, seats and shock, rivets and screw machine parts.

A comprehensive display is exhibited at the Chicago Show.

The present officers are Arthur V. Davis, chairman of the Board; Roy A. Hunt, president; R. E. Wilcox, vice-president and treasurer; G. R. Gibbons, vice-president in charge of sales; Geo. J. Stanley, general sales manager; and Harold Byrnes, assistant general sales manager. Executive offices and plant are at Pittsburgh, Pa.



Left to right—J. H. Althaus, vice president, Althaus & Althaus Co.; E. E. Porterfield, Jr., president American Eagle Aircraft Corp.; C. R. Ahlmann, gen. mgr. of sales, American Rolling Mill Co.

American Aircraft Corp.

Designing, developing and managing airports was the aviation program which lay behind the formation of the American Aircraft Corp. William Hanks, the president of the company, has been the head of his own building and building firm, but also has always been keenly interested in the developments and growth of aeronautics. Serving the field from the business viewpoint, it seemed as though the problems of airport management were sufficiently similar throughout the country to make worth while the organization of a company specializing in that business.

American Aircraft was incorporated Jan. 6, 1928, and offices were opened at 527 Fifth Ave., New York. Since Mr. Hanks, the officers of the company are Martin Dodge, secretary and vice president; Guy George Gabele, treasurer; and John F. O'Rourke, general manager. During the year, the firm has been engaged by 35 cities and companies to do various phases of the work connected with the development and management of new airports. Among these are Phila. Philadelphia Air Terminal, Inc., the City of Newark, Washington, Springfield, Lowell and Phoenix.

The company is exhibiting a model of an airport at the show, and size drawings and plans for hangars, field, etc.

American Cirrus Engines, Inc.

American Cirrus Engines, Inc., New York, N. Y., is a new firm organized to manufacture and merchandise the Cirrus Mark III, four cylinder, vertical, air cooled engine in the United States. The formation of the new company is the direct result of the purchase of the exclusive American sales, manufacturing and distribution rights for the popular British power plant by a banking syndicate headed by Campbell, Peterson and Co., 84 William St., New York. R. Foster Campbell, chairman of the board of directors of the Campbell, Peterson company, is president of American Cirrus Engines, and A. C. Hoffman is the vice-president of the new concern.

Several Cirrus engines of the Mark III type are on display at the booth occupied by American Cirrus Engines, Inc., at the International Aeronautical Exposition being held in Chicago, this week.



Left to right—W. G. Treiber, sales manager, SST Corp.; William E. Arnold, mgr. Airport Division, The Austin Co.; John C. Jackson, president, Austin Machine Co.

In conjunction with this display, Air Associates, Inc., well-known New York contracting firm, which has the sole distribution rights in the United States for the Avro "Aries" light plane, is exhibiting the famous Avro used by Lady Heath in her long distance solo flight. This plane is powered with a Cirrus Mark III engine. In addition, the company is making tiny demonstrations at the Chicago Municipal Airport with an Avro equipped with the Handley-Page slotted wings, and powered with a Mark III engine.

Aviation Protection, Inc., an insurance company with headquarters at 110 William St., New York is also exhibiting.

American Eagle Aircraft Corp.

American Eagle Aircraft Corp., airplane manufacturer with headquarters at 2800 E. 13 St., Kansas City, Mo., is exhibiting four planes at the show. Three of these planes are new products. They are a two passenger, folding wing, sport biplane; a two passenger, training service plane; and a cabin monoplane of the conventional type, which is designed to carry three passengers in addition to engine or fuel, or five passengers. Besides these three new planes, the company is displaying the three passenger, open cockpit biplane which has been in production for some time.

The American Eagle company was organized in April, 1925. The first 34 models of its existence were developed almost entirely by experimental work. Production was feebly started on a three passenger biplane. Increased demand for this plane soon made expansion of the manufacturing facilities necessary and in February, 1928, the company moved into larger quarters.

The manufacturing accounts were re-organized last September and plans for an extensive program of expansion were inaugurated. This program included the erection of a new plant, new model construction, at the Varian Airport Kansas City, Mo. The factory will have a total floor space of 65,000 sq. ft. as compared with the present 25,000 sq. ft. of floor space contained in the present plant. The factory buildings and installation of equipment, it is expected, will be completed January 1, and production will be started immediately on all four types of American Eagle planes.

The present officers are E. E. Porterfield, Jr., president; E. E. Clark, vice president; M. I. Aylerstein, treasurer; and Harold M. Siegel, secretary. Members of the board of directors include Harry Clifford, longest automobile race driver, and Charles O'Toole, New York exhibit and aviation enthusiast.

American Rolling Mill Co.

The American Rolling Mill Co., manufacturer of iron and sheet steel specialties, with headquarters at Middletown, Ct., was organized in 1896. In the 38 years of its existence it has grown from an organization with an invested capital of \$250,000, to one with capital of more than \$115,000,000.

This growth is attributed by officials of the company to the success "Aries" export iron and steel in industry. This product, which was introduced by the company over 20 years ago, has found a wide variety of uses. It is now used by the aeronautical industry in the construction of hangars, in the manufacture of gasoline tanks and for engine manifolds. It is also used extensively for drain pipe. In this form it is finding a ready market among export contractors. The various uses of the iron are being shown by the company this week at Chicago.

The officers of the American Rolling Mill Co. are George M. Verity, president; J. H. Brantz, first vice-president; Charles E. Back, vice-president and general manager; W. S. Hynes, vice-president; W. J. Varian, secretary; Calvin W. Verity, treasurer; and assistant general manager W. W. Schell; J. P. Miller, J. B. Tytus, D. Fosselbecker and Bennett Chaplin, vice-presidents; Margaret Thompson, assistant secretary; C. W. Davis, assistant treasurer; M. A. Bessley, assistant treasurer; and F. B. Hase.

Altkinson Aviation Co., Inc.

The Altkinson Aviation Company, Inc., has just been incorporated at 406-412 Washington Street, Gary, Indiana. It is said to be trading in excess of 100 orders at present.

In addition to manufacturing wings and parts, the company is developing its own training plane. J. H. Altkinson organized the original school in November.

1927. The present officers are V. V. Young, president; L. H. Althaus, vice-president and general manager; Mary Irwin, secretary and treasurer; C. N. Marcus, chief engineer; and F. W. Morrow, service manager.

The firm is now planning to erect a school and shop building on its own property. The officers of the firm will be at the Chicago Aircraft Show to explain to the public the equipment and method of training.

The Austin Company

The Austin Company, founded by Samuel Austin in 1878, and originally located at 1259 Broadway, Cleveland, O., entered the aeronautical field in 1917. The company engages in preliminary surveys, site selection and construction of complete airports, and the design, construction and equipping of hangars of all types and sizes up to a clear span of 200 ft.

The firm is featuring a light model of a complete airport in its exhibit, which also includes drawings and photographs of airports and airport buildings, with hotels and other structures for those engaged in the aeronautical industry.

W. J. Austin is the president and general manager, G. A. Ryan, Jr., vice-president and general sales manager, and C. W. Krasnow, secretary and treasurer. The headquarters of the firm are now located at 16312 Euclid Ave., Cleveland, O.

Austin Machine Co.

The Austin Machine Co. was founded in 1892. For more than a third of a century this firm has been engaged in the manufacture of precision machine tools, oil pumps and other machines. Today the company is offering a series of highly radial air cooled engine developing 130 hp. for use in airplanes.

In August, announcement was made by officials of the company that it had purchased the business of Frank L. Goodrich, Inc., manufacturer of the "Pinto" seven cylinder, radial air cooled engine, and that the entire produce of the resources of the machine company were being placed behind the immediate production of the engine. At the same time the name was changed. The engine, which develops 130 hp. at 1800 r.p.m., is now known as the Austonia. It is this engine, which is on display at the exhibit of the Aviation Company in Chicago. July 1.



Left to right: E. Howard Pigg, president, The Bala Wood Co., Inc.; Vincent Bendix, president, Bendix Brake Co.; Giuseppe M. Bellanca, president, Bellanca Aircraft Corp.

Aviation, president, and Fred Worthing, William Lacey and William Judd, who are members of the factory staff of the machine company, are in charge of the display.

B. B. T. Corporation of America

The B. B. T. Corporation of America, producer of eight flying equipment for navigators and airports, was organized in August, 1924. C. Townsend Lushington and W. Wallace Koffert were the founders. The firm at first imported lighting equipment from France, but eventually began to manufacture equipment, with the exception of the dropless Fresnel lenses which are still obtained from the French firm of Barbet, Senard and Yvernet.

The products of this company are well-known. They were used to equip the first regular night flying route from Chicago to Cleveland, Wyo., the night flying route from New York to Chicago, and are used on the Navy's aircraft carriers, the "Langley," "Lexington" and "Battleship," according to officials of the firm.

The B. B. T. Corporation is located at 816 Atlantic Ridge, Philadelphia, Pa., and is headed by Mr. Lushington, who is president; Mr. Koffert, who is secretary-treasurer; and S. G. Keller, vice-president. The company is collaborating the Q-5 fishing boat, AF floodlight, PF hangar floodlight, and the H-8-D intermediate air and landing field floodlight at the Chicago show.

Bala Wood Co., Inc.

The Bala Wood Co., Inc., was organized March 1, 1925, with offices at 333 Madison Ave., New York, N. Y. The original officers were E. Howard Pigg, president; Elmer J. Chambers, secretary and treasurer; and F. G. Sweeney, assistant secretary. The company immediately entered the new field by manufacturing streamline parts for airplanes.

Other of the products are model airplanes of Bala wood, bumper blocks for packing luggage, tailing machines and fastening devices for radio, load shackles, shackles and isolation blocks, fittings for motor boat helix, etc.

The firm is showing Bala wood, airplane parts, models and novelties at the Chicago aircraft show.

An addition to the original officers is James F. Downey, general manager of the firm, which now operates at 138 Pioneer St., Brooklyn, N. Y., and 331 Madison Ave., New York, N. Y.



Left to right: E. Howard Pigg, president, The Bala Wood Co., Inc.; Vincent Bendix, president, Bendix Brake Co.; Giuseppe M. Bellanca, president, Bellanca Aircraft Corp.



Left to right: T. B. Colby, manager, aviation department, Navy, Dept. of Navy; A. K. Johns, president, Johns Industries; and Bruce Cook, P. G. Johnson, president, Boeing Aircraft Co.

Bellanca Aircraft Corp.

The Bellanca Aircraft Corp. was organized on Dec. 31, 1917, at 3491 Robinson Terrace, Staten Island, N. Y. The original officers were G. M. Bellanca, president; E. M. Rogers, Jr., vice-president and treasurer; and A. D. Hooper, secretary. Shortly after its organization the company started production of the Bellanca CII and K models. However, while not devoting its time exclusively to the Bellanca CII the firm has concentrated on the production of five other monoplane until now it is producing on the average of two a week and it has been announced by the officials that one plane a day will be the average production after the first of the coming year. A Bellanca CII six passenger monoplane, powered with Wright Whirlwind engine, is on display at the Coliseum in Chicago.

Since the date of formation the company has moved its headquarters to New Castle Blvd. G. M. Bellanca is now president while R. E. Redington is vice-president and Andrew Bellanca, secretary.

Berry Bros., Inc.

The firm of Berry Bros., Inc. was organized by Thomas Berry and Joseph Berry in 1918. The address of the company at that time was 211 Lock Street, Detroit, Mich., and it is interesting to note that the nursery and pearl manufacturing home of all members is headquartered at the same address.

Berry Bros. first entered the aeronautical field in 1916 when it began selling airplane toys to the Allied nations in the World War. In 1924 the dogs manufactured by this concern as well as its subsidiaries, were adopted for use by the U. S. Army and Navy. In this same year, Berry Bros. was adopted by the French government for use in protecting fortifications. The aircraft business transacted by the concern had grown to such proportions in 1925 that a special aviation division was formed. This division is under the direction of Thomas B. Colby. In addition, the company now maintains a laboratory which is specializing in the development of wireless radios. It also has a special sales force to handle the aircraft business.

Aircraft "Berryflood," Lincoln, varieties, dogs and sh-

bel products are now manufactured by the Berry Bros. house. The company is featuring motion pictures of the 1928 National Air Year color prints and looking on looking at its exhibit. The present officers are F. L. Colby, president; W. R. Casper, manager; and George V. Blomquist, treasurer. Thomas B. Colby is the manager of the aviation division and his assistant is T. A. Murphy.

Bendix Brake Co.

The Bendix Brake Co. was organized in 1924 to manufacture Bendix 4 Brakes for automobiles. The original officers were Vincent Bendix, president; Walter J. Baertner, secretary and treasurer.

The firm entered into the aeronautical field in 1927, making Bendix wheels and brakes for airplanes. The Bendix airplane wheels and brakes have been approved and accepted by the U. S. Army, the U. S. Navy and many of the well-known commercial aircraft builders.

The present officers are Vincent Bendix, president; Walter J. Baertner, secretary and treasurer; and John E. Cassidy in charge of the Airplane Equipment Division.

General offices are at 404 Bendix Drive, South Bend, Indiana.

Black & Decker Manufacturing Co.

About 15 years ago, Black & Decker Manufacturing Co. entered the automobile industry with the introduction of a line of productive and service equipment. The products of the company have been licensed gradually in number and the line of equipment now includes production machinery, tools, tool kits, wheel brakes and portable electric tools of almost every description. The portable tools made by Black & Decker are on display in Chicago. The present officers of the company are S. M. Black, president; Alton G. Decker, vice-president and general manager; Charles J. Fox, second vice-president; Benjamin J. Riley, third vice-president; George M. Kimbly, treasurer; and Charles A. Sauer, assistant secretary. The headquarters of the company are in Towson,

Mid. In addition, branch offices are maintained in Boston, New York, Philadelphia, Baltimore, Atlanta, Cleveland, Chicago, Kansas City, Detroit, Oakland, Buffalo, Minneapolis, Dallas, and St. Louis. Other branches are located in Canada and the British Isles.

E. W. Bliss Co.

E. W. Bliss Co., manufacturer of heavy machinery and presses, organized in 1857 as Bliss and Williams, a partnership formed between E. W. Bliss and J. H. Williams. A few years later Mr. Bliss purchased the interests of Mr. Williams. The present firm was incorporated about 28 years ago, and since that time has grown until it now has five factories in the United States, and is one of the largest manufacturers of sheet metal machinery and automatic cranking presses in the world.

The company is entering the aeronautical field and is preparing to manufacture in the United States the famous Bristol "Jaguar" engine, a product of the Bristol Aeroplane Co., Ltd., of England. The engine manufactured in the United States will be known as the Bliss "Jaguar" and will be available in both the geared and direct drive types, as models to cover practically every field. The firm expects to start production during January, 1939, and the first American built Bliss "Jaguar" is expected to be turned out during the latter part of that month. One of the Bristol "Jaguar" engines is on display at the E. W. Bliss plant at the Chicago show.

E. W. Bliss Co. is under the guidance of Frank C. B. Page, president, and Frederick D. Mackay, vice-president. General offices and the main plant are located at Ave. and 53rd St., Brooklyn, N. Y.

Boeing Airplane Co.

This concern, which manufactures both military and commercial planes in its plant at Seattle, Wash., is an outgrowth of the Pacific Aero Products Co., which was formed in 1916 and was operated under that name until the following year when a reorganization was effected and the name was changed to Boeing Airplane Co.

Since the days of the Aero Products company, remarkable progress has been made by the firm. From the com-

munication industry and airplane began occupied by the original company, the plant has been expanded until it now occupies 11 buildings, containing a total of 250,000 sq. ft. of floor space. Other units are now under construction, which will increase the total floor space 30 per cent. One of the features of the factory is that almost every item used in the construction of Boeing planes is manufactured there from the raw materials.

According to officials of the Boeing company, almost 2,000 planes of various types have been turned out by the factory to date. Up until 1932, the firm specialized almost entirely in the manufacture of military and naval planes. These included training, pursuit, attack, observation, bombing and fighting types. With the formation of Boeing Air Transport, Inc., however, the company extended its activities to the manufacture of commercial types, which include mail planes and three engine transports. The Boeing company also is producing the model B-1E flying boat. This machine is being displayed at the International Aeronautical Exposition.

The original officers of the company were W. E. Boeing, president; E. H. Kent, vice-president and treasurer, and J. C. Policy, secretary and general manager. Mr. Boeing is now chairman of the board; P. G. Johnson is president; C. L. Egbert, first vice-president and general manager; George P. Johnson, vice-president and eastern representative; C. E. Brink, treasurer, and C. W. Tappet, secretary.

Bohn Aluminum & Brass Corp.

The Bohn Aluminum and Brass Corp. was first organized at 4512 E. Grand Boulevard, Detroit, Mich. The original officers were Chas. B. Bohn, president; P. A. Marley, vice-president and treasurer, and A. P. Lauer, secretary and assistant treasurer.

The original products were bearings, ballbearing castings and pistons. Entering the aeronautical field, it has been supplying Ring True Brasses and Steel ball-bush lined bearings, heat treated Sodaline castings for crankshafts, pistons, cylinder heads, etc., also permanent and semi-permanent mold castings. The firm has been working with aircraft and engine builders in developing new applications of its products and improved methods of manufacture.

The present officers of the company are Chas. B.

AVIATION
December 1, 1938

AVIATION
December 1, 1938



Left to right: Clyde V. Casper, president, Casper Aircraft Co.; E. H. Snodden, Jr., president, Casper Aircraft Co.; H. B. Gey, vice-president, Eastern Stomper Battery Co.

Bohn, president; P. A. Marley, vice-president and treasurer; C. W. Egbert, vice-president; H. W. Bell, vice-president; W. T. John, vice-president; and A. E. Lauer, secretary and treasurer.

The company is showing a complete line of bearings, crankshafts, air-cooled cylinder heads and other engine and control castings.

Brownbush Motor Laboratories, Inc.

Brownbush Motor Laboratories, Inc., 430 Lexington Ave., New York, N. Y., is exhibiting a six cylinder, 100 hp. radial air cooled engine in its display. This engine, which is known as the Model C-400, is now being manufactured by the company in Portsmouth, Pa., and the first delivery was scheduled to begin March 1, 1939.

The Brownbush Laboratories originally began operations in Norristown, Pa. In 1930, the company entered the aircraft industry, becoming the importer of a foreign radial air cooled engine. Recently, however, the importation of this engine was discontinued, so that the company of the past might be concentrated on the development and manufacture of the model C-400.

The officials of the company are Charles H. Phelps, president; Harry L. Brownbush, vice-president, and Robert G. Lyon, general manager.

Bull Aircraft Co.

Bull Aircraft Co., plane manufacturer, was founded in March, 1935, and established headquarters at 2730 West Ave., Detroit, Mich. The original officers were L. D. Bull, president; A. V. Vanik, vice-president, and H. P. Smith, secretary and treasurer. The first model produced by the company was the Bull "Aircraft," a three passenger, seven cockpit biplane. The plane was particularly well received. Later the Bull "Aircraft" were introduced. These models are of the enclosed cabin type, as the name gives them insight, and include the "Bomber," "Tender," "Special" and "Standard." The Bull company has enjoyed a steady growth as a result of the popularity of its products, and now maintains its factory and headquarters at Marysville, Mich. The present officers are Mr. Bull, president; H. Hagles, vice-president, and Mr. Smith, treasurer. The company is displaying its Scout and Sport Aircraft in Chicago this week.

Butler Aircraft Corp.

Butler Aircraft Corp. was organized last October as a subsidiary of Butler Manufacturing Co. to market the planes, hangars and aircraft accessories produced by the latter concern. The officers of the aircraft company are E. E. Bonquist, president; William A. Knapp and Roy S. Knapp, vice-presidents; F. A. Rafi, secretary, and Omar D. Nelson, treasurer. The firm is exhibiting the latest Butler plane, a cubic model, this week at the International Aeronautical Exposition in Chicago.

Recently, the company entered the airplane manufacturing business, producing the "Skyway" biplane, which was designed by Waverly Goodman. The new cubic model is the second plane developed by the company.

The headquarters of both Butler Manufacturing Co. and Butler Aircraft Corp. are located at 1115 and 1125th, Kansas City, Mo. In addition, the parent organization maintains a branch in Minneapolis at 900 6th Ave., Minneapolis. The officers of the manufacturing company are E. E. Bonquist, president and general manager; W. A. Knapp, vice-president; R. S. Knapp, vice-president and credit manager; F. A. Rafi, secretary; and O. D. Nelson, treasurer. Victor C. Bonquist is the plant engineer. C. C. Cronin is a vice president and is also the manager of the Minneapolis division.

Casco-Leather Specialty Co.

This company, which was established in 1933, began operations with the manufacture of golf, mud, tool, and other carrier bags, as well as poloists' freight bags and tool boxes. About five years ago, the company entered the aircraft industry with its line of "Scout-Swing" flying clothes. The line now includes summer and winter helmets, winter flying suits of various types, face masks, and radio and crash helmets. The company also manufactures mud shoes and gum-soled shoes, which are also made. Several of the models included in the Scout-Swing line were designed for the Army and Navy. Among these are the "Navy Superior" flying suit and the "Army Special." These suits together with the "Commercial" and the "Diplomat" summer suits, which are also made by the company, are being featured in its exhibit at the



Left to right: E. E. Bonquist, Butler Aircraft Corp.; Jacob Thomas, president, Capital Aircraft Corp.; B. G. Bullberg, president, The Casco Co.

Colosium during the aircraft show. The center is also displaying the various types of helmets and accessories which it manufactures.

Stanley Smith is the president; Walter Smith is secretary, and W. A. Seligson is the sales manager of the Canvas-Leather Specialty Co. The firm's temporary manufacturing quarters at 733-737 Cass Street, Trenton, N. J. The present address of the company is South Street and Dye Bldg., Trenton.

Capital Aircraft Corp.

After some years of experimental work and research on training planes the Air Trainer monoplaner was designed and built. Four months after the actual work of construction began the plane was test flown and surpassed the expectations of the designers and builders. After the test flights of the plane had been completed a factory site was purchased in Lansing, Mich. A short time after operations were started, to be exact on Sept. 1, 1928, a corporation was organized which elected as its president Joseph Thomas, Donald D. Thomas as vice-president, Harry Little, secretary, and E. D. Kerner as treasurer.

An Air Trainer model monoplane is being exhibited by the Capital Aircraft Corp. at the Chicago show.

Cessna Aircraft Co.

Cessna Aircraft Co. was organized on September 8, 1927, by Clyde W. Cessna, formerly of the Travel Air Manufacturing Company.

With Mr. Cessna as president, the following were the original officers: Geo. H. Siebald, vice-president, M. T. Haggis, secretary and treasurer, C. A. McGerike, attorney, and W. B. Harrison, Henry J. Allen and James P. Verna, directors.

The firm is building center-wing monoplanes moving from the two plane cabin plane to the three plane cabin plane. Although the company is one of the younger organizations, it reports building 30 planes the first year. The exhibit at the Chicago Show will be its latest six place cabin monoplane.

The original members of the firm still maintain their offices. Plant and administration buildings are located at 1st and Glen Street, Wichita, Kansas.



Left to right: Joseph Laybold, president, Consolidated Instrument Co.; C. M. Keys, president Curtis Aeroplane & Motor Co., Inc.; May R. H. Platt, president, Consolidated Aircraft Corp.

The Colson Company

The Colson Company, located at 643 North Michigan Ave., Chicago, Ill., is exhibiting at the Chicago Show a monomotor biplane fitted with Colson, and also the cabin of a two-motor, Colson biplane. Colson is a board that is manufactured from sugar cane fibre, a waste product, and is resistant to heat, cold, noise and moisture. The company is also exhibiting samples illustrating the use of Colson in conjunction with plywood and plymethyl. Colson products saturated with pyramycin lacquers and synthetic resins will also be shown.

B. G. Dahlberg is the president of this firm which was organized about seven years ago.

Cleveland Pneumatic Tool Co.

The Cleveland Pneumatic Tool Co., 3734 E. 78th St., Cleveland, O., is the manufacturer of the "Aero" structural loading gear. Since the introduction of these units in 1926, a number of the leading aircraft manufacturers have adopted them as equipment for their planes, with the result that there has been a steady increase in the volume of business transacted by the Cleveland company. Eight different sizes of Aero struts are manufactured for commercial airplanes and four are made for military and naval planes. The various sizes of struts and Aero struts, which are also manufactured by the company, are being exhibited in the booth of the company. The officers are Chas. Green, president; L. W. Grove, treasurer; and H. C. Covey, secretary.

Command-Aire, Inc.

Command-Aire, Inc. is said to be the only aircraft manufacturing concern in the South. Originally organized in the Spring of 1926 by W. E. Moody and J. Carroll Cook with the idea of establishing a flying service at Little Rock, Arkansas, the company soon interested capital for aircraft manufacture. The firm now builds a three plane open biplane designed by Albert Voelckers.

Command-Aire, Inc., also has the American selling rights of "Phylax," an automatic fire extinguisher for airplanes. The firm has an display at the Chicago



Left to right: R. D. Huber, president Forging and Mfg. Co., Inc.; W. F. Wise, president Tool & Mfg. Co.; Ernest Robinson, president Partridge Aerial Camera Corp.

Aircraft Show a Command-Aire biplane and the "Phylax" fire extinguishers. The exhibit is in charge of Capt. Wright Verrill, chief test pilot.

The company was reorganized October 1, 1928. The new officers are R. E. Snowden, president; Charles M. Taylor, vice-president; and W. F. Moody, secretary and treasurer. J. J. Feeley is production manager and Mr. Voelckers is chief engineer.

Consolidated Instrument Company of America, Inc.

The Consolidated Instrument Company of America, Inc. was organized in 1926 with headquarters at 460 Eighth Ave., New York, N. Y. The original officers were Joseph Leopold, president; P. R. Goodrich, vice-president, and Hugh W. Gallahan, secretary-treasurer. These men are still at the helm. The first products manufactured by this company were instruments. Gradually the number of instruments manufactured was increased until now the company offers a complete line of aviation and marine instruments as well as a number of accessories. This line is being exhibited during the International Aeronautical Exposition.

The aviation instruments and accessories produced by the Consolidated company are altimeters, air speed indicators, engine controls, sextants, fuel strikers, "Star Path" fueler compasses, liquid indicators, oil pressure gauges, temperature gauges, tachometers, propeller gauges, running lights, running light switches, landing lights, landing light switches and clocks. The company also manufactures what is known as its type "A" aircraft panel, which includes tachometer, a precision altimeter, a distinctive type thermometer with 10 ft. of capillary tubing and two electric lights with flexible cord connections. Consolidated aircraft instruments and accessories are now in use on a large number of planes in the United States.

The Consolidated company recently established a complete testing laboratory in connection with its New York headquarters, which are now located at 30 E. 4th St., under the direction of E. A. Heman, well-known engineer. Additional plans for the further development of the activities of the Consolidated company are now being formulated.

Consolidated Aircraft Corp.

Consolidated Aircraft Corp. was organized May 29, 1923, with May R. Platt as president and general manager, W. C. Clark, vice-president and chief engineer; G. Newman, factory manager; and Thomas Keady, secretary-treasurer. A factory was opened in East Greenwold, N. Y., and the manufacture of a plane, known as the "TW-3," was started.

Since that time the company has produced a number of other models. A number of planes of these types are now in use by the Army and Navy. The various models are the "PT-1," "NY-1," and "NY-2," both land and airplanes; "PT-3," "NY-3," "PT-4," and the model 10 cabin monoplane. In addition, the company developed the "XPV-1" as a long distance patrol boat for the Navy. Records of the company show that since 1923 it has produced eight of the PT-3A type, 135 NY-2A, 66 NY-3A, 13 "Conservs," 138 PT-3A, 224 PT-1's, one model 10, one NY-1 and 20 TW-3's.

The Consolidated company is now located at 2650 Haverwood Ave., Buffalo, N. Y. The present officers are R. E. Platt, president and general manager; G. Newman, vice-president and factory manager; E. D. Bell, administrator; J. M. Govea, Jr., chief engineer; Capt. 1, J. M. Laddan, chief engineer; Capt. 2, and Thomas Keady, secretary-treasurer. As its exhibit, this airplane manufacturing company is exhibiting the Consolidated PT-3A, the "Conserv," and the "Honey" juicer.

Cross-Hatch Co.

Cross-Hatch Co., Syracuse, N. Y., was one of the first firms to enter the aeronautical industry with a complete line of airport and airway lighting equipment. Its products include airport projectors, revolving beacons, boundary lights, landing field lights, etc.

On display in the booth of the company at the International Aeronautical Exposition are a revolving beacon, two landing field floodlights, one of which is of the 180 deg. type; a floodlight for hangar roofs, a cutting projector, course lights, floodlights for ground lighting purposes, a ceiling light indicator, boundary and obstacle lights, (parabolics), hand lamps, reflectors and groundbeams.

The officers of Cross-Hatch Co. are H. R. Conant, president; W. L. Plunk, vice-president; A. E. Hills, secretary, and W. C. Hanning, treasurer.

Curtiss Aeroplane & Motor Co., Inc.

One of the most active pioneer companies in American aviation history is the Curtiss Aeroplane & Motor Co., Inc., at Garden City, L. I., New York. The original company was organized in 1910 and located at Jansonsvilleport, N. Y. Although the company was organized in 1910, its president, Glenn H. Curtiss, had built several planes prior to this time. His first notable achievement was the winning of the first Gordon Bennett Cup Race at Rheims, France, in 1909. In 1911 and 1912, Mr. Curtiss and his associates invented the hydro-aeroplane and flying boat. The Curtiss organization designed and built the Navy Curtiss NC-4, the first airplane to cross the Atlantic. It also constructed the planes that won the Pulitzer Trophy Speed Races of 1911, 1922, 1923, and 1924, and the Schneider Cup Seaplane Races of 1923 and 1925. The company designed and constructed many planes and engines for the Government in 1917-18.

Working with the Curtiss Aeroplane & Motor Co., Inc., is its sales agent, the Curtiss Flying Service, which is headed by "Doc" Jones as president. Curtiss Flying Service was also originally organized in 1910 as the Curtiss Exhibition Co. and has within the last few weeks reorganized so that its activities may be expanded to cover a nationwide chain of flying fields, flying schools and sales and service stations.

The large display space of the Curtiss Aeroplane and Motor Co. at the Chicago Show is filled with a large number of outstanding exhibits. Among them are the Curtiss "Pioneer," a touring plane powered with the new 170 hp. Curtiss Challenger air-cooled engine; the Curtiss "Robin," a three-place cabin monoplane, also powered with a Challenger. There is also at the booth a Sikorsky Amphibious with its two 410 hp. "Wasp" engines. The 170 hp. "Challenger" and the 600 hp. "Dixie" are on display. An unique contrast is afforded by the display of the motorcade and the 40 (to 80) engine, which was constructed by Glenn Curtiss in 1912. Curtiss-Reed radial propellers are also in the booth. The exhibit is in charge of C. S. Jones, and M. V. Clements.

C. M. Myers is president of the Curtiss Aeroplane & Motor Co. Other officers are F. H. Russell, vice president; J. A. B. Smith, secretary-treasurer; Laver-

and Kennedy, vice-president; W. L. Lacycraft, assistant treasurer, and A. C. Williams, assistant secretary and cashier.

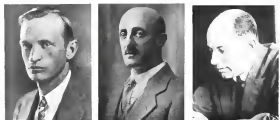
Arnco Calvert Manufacturers' Association

Arnco Calvert Manufacturers' Association is an organization of 21 calvert manufacturers in the United States and Canada, who produce corrugated metal calverts constructed of "Arnco" ingot iron. The association was formed in 1906, and is the first of its kind to have developed an association largely to the manufacturing and legal problems that confronted its members. Today, the organization is engaged in research and educational work, as it has been since 1925. The headquarters of the association are located in Midland, O.

The members of the Calvert Manufacturers' Association are Bush River Bridge & Calvert Co., Boardman Corrugated, Burreham Iron Co., California Corrugated Calvert Co., Canada Ingot Iron Co., Ltd., Doss Calvert & Metal Co., Dixon Calvert Mfg. Co., Hendry Mfg. Co., Highway Products & Mfg. Co., Independence Corrugated Products Co., Ingot Iron Railway Products Co., Iowa Pure Iron Co., Kearsley Calvert Mfg. Co., Louisiana Corrugated Calvert Co., Lytle Calvert & Road Equipment Co., Maryland Calvert & Metal Co., Missouri Pure Iron Co., Nebraska Calvert & Mfg. Co., New England Metal Calvert Co., North East Metal Calvert Co., (Division of New England Metal Calvert Co.), Northwestern Sheet & Iron Works, Ohio Corrugated Calvert Co., The W. Q. O'Neill Co., Pure Iron Calvert & Mfg. Co., Road Supply & Metal Co., Sioux Falls Metal Calvert Co., Spokane Calvert & Tank Co., Tennessee Metal Calvert Co., U. S. Bridge & Calvert Co., Virginia Calvert Corp. and Western Metal Calvert Co.

Curtiss-Rebertson Airplane Mfg. Co.

Curtiss-Rebertson Airplane Mfg. Co. is a combination of the engineering experience of Curtiss Aeroplane & Motor Co. and the manufacturing and manufacturing experience of a group of St. Louis business men. The Curtiss-Rebertson company was founded last February. On March 5, ground was broken on the St. Louis flying



Left to right—C. H. Day, vice president Gates-Day Aircraft Corp.; A. Francis Arroy, vice-president, General Airplane Corp.; Anthony Fabbri, Public Airplane Corp. of America

field for the factory of the new concern. The buildings were erected, on May 23, equipment and tools were wired in, and on August 7, the first plane left the end of the production line. Since that time, the Curtiss "Robin," the three passenger cabin monoplane produced by the company, has been in quantity production.

William B. Robertson, an old-time pilot, who has had many years of experience in the operation of air lines, aerial service, and in the buying and selling of aeronautical materials, is the president and general manager of the Curtiss-Rebertson company. C. M. Keys, president of the Curtiss Aeroplane & Motor Co., is vice-president, and J. D. Livingston, of St. Louis, is secretary and treasurer. On the board of directors are J. A. B. Smith, secretary of Curtiss Aeroplane & Motor Co., Harry Earl Knight, of Knight, Dwyer and Knight; Arnold G. Seidel, of Seidel, Nichols and Co.; J. H. Russell, vice-president of Curtiss Aeroplane & Motor Co.; James C. Wilson, president of J. C. Wilson and Co.; and Edward M. Tishley, of the State National Bank of St. Louis. The officers on the company are likewise directors.

The Curtiss-Rebertson monoplane, which was designed for use with either a Curtiss CXS, or the new "Challenger" engine, may be seen at the exhibit of the Curtiss-Rebertson company in Chicago this week.

DeWalt Products Corp.

DeWalt Products Corp., manufacturer of wood and metal working machinery with headquarters and factory at Leola, Lancaster County, Pa., is an outgrowth of DeWalt Products Co., which was organized as a partnership Dec. 15, 1924, by J. L. Run and Paul Gardner. The partnership continued until last October, when the organization was incorporated as DeWalt Products Corp. The present officers are Mr. Gardner, president; Mr. Run, vice-president and treasurer; W. Ross Stevens, secretary; and Wilbur L. Gardner, assistant treasurer.

The original DeWalt Products Co. first entered the aeronautical industry with the introduction of the DeWalt "Wonder Worker." This is a wood-cutting machine, designed to cut at any angle, or any combination of angles. Later, when airplane manufacturers began to adopt metal construction, the company developed the DeWalt "Wonder Metal Worker," which operates along the same lines as

the Wonder Worker, but which can saw steel instead of wood. Both of these machines are on display at the Chicago show.

In addition to the Wonder Worker and the Wonder Metal Worker, the DeWalt Products Co. manufactures a cut-off and enter saw, portable electric individual down load saw, direct motor driven marker, and a direct driven grader.

Driggs Aircraft Corp.

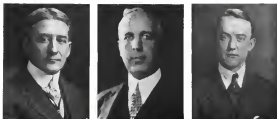
The Driggs Aircraft Corp., of Lansing, Mich., was organized in February, 1927, with H. F. Harper, president; Iva H. Driggs, vice-president; E. C. Fields, secretary; and H. B. Lundberg, treasurer. These men are still in contact. The company at once began the manufacture of the Driggs "Dirt" light airplane. Although the firm is of late origin, Mr. Driggs, the chief designer, and his planes, have been well known in the industry for a number of years. Mr. Driggs has made a close study of light airplane building in Europe and is one of the best informed engineers so far as light aircraft are concerned in the United States today. The "Skylink," a new plane produced by the Driggs Aircraft Corp., is being shown for the first time at the exhibit of this airplane manufacturer.

The Electric Storage Battery Co.

The Electric Storage Battery Co., manufacturer of "Dixie" batteries, was organized June 5, 1908. The original address of the company was Gloucester, N. J. In September, 1917, the company began the manufacture of its first airplane storage batteries.

From the original aviation batteries, the company made rapid progress in the development of larger aircraft batteries for storage purposes, as well as to meet the present needs of aircraft lighting equipment. The latest development of the company is that of special batteries to be used for radio beacon receiving sets when a separate battery is required in the plane. A standard line of aircraft batteries is being exhibited at the show.

The officers of the company are John B. Williams, president; Kenneth S. Selby, vice-president; Bruce Ford,



Left to right—Conrad Staupp, president, General Electric Co.; P. W. Lachfeld, president, Goodyear Tire & Rubber Co.; John M. Hunsford Jr., Gordon & Ferguson

vice-president and general manager; H. B. Gay, vice-president, and Walter G. Henderson, secretary and treasurer. The present address of the Electric Storage Battery Co. is Allegheny Ave. and 19 St., Philadelphia, Pa.

Elgin National Watch Co.

Elgin National Watch Co. was organized August 27, 1884. The original address, when the company first began operations at Elgin, Ill., were U. W. Raymond, president, B. F. Lawrence, vice-president, and G. M. Wheeler, secretary-treasurer.

The company entered the aeronautical field in 1917 when it began the mass production of the Army type "C" Elgin chronometric barometers. Since that time its aircraft business has been expanded to include the manufacture of Elgin quartz control boards, "Avig" compasses and bar altimeters. These products may be seen in the hands of the company.

The present officers are DeForest Hubbard, president; Taylor Simon, vice-president; J. R. Perry, secretary-treasurer; W. S. Campbell, assistant secretary-treasurer; and Gordon C. Gibbs, manager of the aircraft instrument division, which is located at Elgin, Ill.

Endicott Forging & Mfg. Co., Inc.

The Endicott Forging & Mfg. Co., Inc., was founded at Endicott, N. Y., in 1845, by S. J. Marshall, president and treasurer; Walter A. Lester, vice-president; and Thos. A. McClary, secretary. This firm entered the aeronautical field in 1918 specializing in auto engine and plane forgings. The company, during the last 30 years, has furnished forgings to every of the famous aircraft engine builders. The officials state that much emphasis is put on the proper control of heating, thermal forging and a special selection of steel, regardless of its chemical composition. This careful method of manufacture is creating each year a much heavier demand for Endicott forgings.

Electric equipment, capable of handling forgings 14 to 30 lb., is on display at the Chicago Show.

The management of the concern is directed by S. J. Marshall, president and treasurer; T. B. Kiddy, vice-president; and D. O. Freeman, secretary. The factory is still located at its original address.



Left to right—Francis Rogers, Generalized Aircraft Co.; James R. Fitzpatrick, vice-president, Nashville Mfg. Co.; Charles W. Hall, president, Hot Airblown Aircraft Corp.

Ex-Cello Tool & Manufacturing Co.

Ex-Cello Tool & Manufacturing Co. was organized in Detroit, Michigan, in 1919, by N. A. Woodward as president. The firm entered the aeronautical field in 1921 with engine parts involving precision latitudinal grinding. Since that date the company has greatly enlarged its line of parts. It is now devoting a department of the business to aircraft engine parts and is serving practically all the leading engine builders.

The company has on display, at the Chicago Show, samples of its full line of engine parts.

N. A. Woodward is president and P. Huber is secretary. Wm. F. Wise, production engineer, is in charge of the aircraft engine parts, also in charge of all sales in the industry. The company is now located in its new building at 1200 Chelsea Boulevard, Detroit, Michigan.

Fairchild Aviation Corp.

The Fairchild Aviation Corp. built its first airplane to carry on with the aerial photography which the Fairchild aerial camera had made possible. However, it was soon found that the planes could be modified for many other purposes and the company, therefore, entered the manufacturing business with a line of planes as well as its line of aerial cameras which had been developed by Sherman M. Fairchild who is president of the firm.

The first Fairchild flying wing class monoplane was built in 1925. The firm is building three models to be produced during 1933—a two place low-wing conventional training plane (the "21"), a four place cabin plane powered with a Wright "Whirlwind" (the "41"), and a seven place cabin plane powered with a Pratt and Whitney "Wasp" (the "71"). All three of these planes are being shown at the Chicago show. The Fairchild Aviation Corp. exhibit there also includes a miniature model of the factory and airport at Farmingdale, L. I.

Fairchild airplanes have been used in troops and in Northern Canada as well as in the United States Army and Navy. The company has on record breaking 23 day trip around the world. Duke Schiller, the first to reach the British Isles at Grimsby Island, flew a Fairchild biplane on this plane.

The principal subsidiaries of the Fairchild Aviation



Left to right—Edward Hughes, general manager, Heywood Starter Corp.; Harry H. Kimple, international director, Equiplant Co.; George Watts, president, The Chert Co.

Corp. are the Fairchild Aerial Manufacturing Corp., Farmingdale, L. I.; the Fairchild Aerial Camera Co., and the Fairchild Aerial Surveys, Inc., both of which have offices at 270 W. 34th St., New York, N. Y. Guyan D. Grosvenor is president of the Fairchild Aerial Manufacturing Corp.

Fairchild Aerial Camera Corp.

This company began operations, when it was organized in 1918, with the manufacture of military aerial cameras. These cameras rank with cameras abroad. As a result, the Fairchild Aerial Camera Corp. is now one of the largest manufacturers of aerial cameras in the world. The cameras manufactured by the company are now used as standard equipment by the U. S. Army and Navy, the Royal Canadian Air Force and by the air corps of other governments. Fairchild cameras hold the military altitude record for photography, and also were utilized by General Richard E. Byrd, U.S.N. (Ret.), and Sir George H. Wilkes, for one during their expedition. Fairchild cameras were flown during the Dr. Henderson Expedition.

The Fairchild Camera Corporation is a subsidiary of the Fairchild Aviation Corp., which was organized to finance, hold the stock and manage subsidiary corporations in both the manufacturing and operating fields of aviation. The present heads of the concern company are Sherman M. Fairchild, and Ernest Robinson. Headquarters for the company are maintained at 270 W. 34th St., New York, N. Y. The complete line of aerial cameras manufactured by this concern are being shown at Chicago.

Fokker Aircraft Corp. of America

In 1911, Anthony H. G. Fokker built and flew the first Fokker airplane, the "Spide", and now models designed by him followed in rapid succession. Up to the present time, it is said that no less than 53 different types have been produced carrying the Fokker trade-mark and over 10,000 Fokker aircraft have been manufactured.

The Atlantic Aircraft Corp., Fokker's first American venture in construction of planes, was organized on December 13, 1922. In November, 1927, Fokker Aircraft Corp. of America was formed and the Atlantic Aircraft Corp. dissolved. The Fokker Corporation now operates three factories, the Tebberle factory, the Glendale, Calif. factory, and one at Passaic, N. J. Under the personal

direction of A. H. G. Fokker, the firm started its first American operations by furnishing the U. S. Army Air Corps with welded steel tube fuselages. In 1923, it developed and placed in production an entirely American type of conventional cabin monoplane known as the "Universal". The popular airplane has continued in production with minor refinements. The Fokker F-7 three-engined plane, was also introduced in 1925. This model was later modified for use by the U. S. Army and Marine Corps as military transport and ambulance planes.

Many successful long-distance flights, the most outstanding of which was the flight of Hughes-Randolph and Linn from United States to Australia and Commander Bertha Bight over the North Pole, were made by the Fokker F-7 plane.

The newest planes developed by the Fokker organization is the F-10, a 14-passenger high-speed conventional monoplane powered with three Pratt & Whitney "Wasp" engines, and its de-ice metal hulls amphibious with a Pratt & Whitney "Wasp" or "Horse" engine.

The firm has on display at the Chicago show an F-30A, the 14-passenger "Wasp" powered plane, a DeLuxe Super Universal, one of their present creations, and the metal-hulled amphibious.

The directors of the corporation are Anthony H. G. Fokker, A. A. Talbot, Elmer M. Housh, H. B. Thibault, John A. Lee, Louis H. Pickett, G. F. Lewis, J. B. Parker, W. P. Wilson, T. E. Gregory and H. A. Reed. General offices are at Midwood, Hingham, N. J.

Follmer, Clapp & Co.

Follmer, Clapp & Co. was organized in 1884 by C. J. Follmer, L. H. Clapp, William Clement, Theodore Butts, Jr. and James L. Brown. In the Fall of 1927 the company entered the aircraft industry with the introduction of its first parachutes.

To date the company has manufactured parachutes, parachute rifles, flare parachutes and aerial tow-ropes. The products of the company are well known and are used by the U. S. Army and Navy. The "Positive Open" parachutes and parachute rifles developed and produced by the concern are being featured in its display. The present officers of the company are H. W. Harrison, president; W. E. Morrison, vice-president; and J. I. Hartman, secretary and treasurer. The address of the company is 258 W. King St., Lancaster, Pa.

Gates-Day Aircraft Corp.

The Gates-Day Aircraft Corp. was organized Dec. 1, 1937. It is an outgrowth of the Gates Flying Circus which was organized in 1931 and was in active operation until the formation of the new company. The aircraft company is headed by John R. Gates, president, Chas. Day, vice-president and chief engineer, George Shaw, secretary, and R. H. Sullivan, treasurer. Headquarters are maintained at 909 E. 23 St., Paterson, N. J.

The company is now producing a five passenger monoplane which is known as the Gates-Day "New Standard" or "GDA-5." This plane is being exhibited by the company in Chicago. The plane was designed by Mr. Day, who produced the famous J-1 Standard. Mr. Day is well-known for his activities in the aeronautical industry, with which he has been associated since 1909. He was formerly associated with Glenn Martin. Mr. Gates is one of the oldest aeronautical operators from the standpoint of experience.

General Electric Co.

The General Electric Co. is a direct outgrowth of the activities of two earlier electrical manufacturing concerns, the Edison General Electric Co. and the Thomson-Houston Electric Co. In 1892 these two enterprises were consolidated and the new company was given the name, General Electric. It was reorganized on April 15 of this year and began doing business in its own name on June 1.

The General Electric Co. entered the aeronautical manufacturing industry in 1917, manufacturing superchargers for use on aircraft in that year. In 1918, the company entered experimental flashlight work in Army aircraft lighting. In 1923, it entered the field of lighting equipment for airports and airports as a commercial item. In this year, the illumination of air mail routes by beacons was accomplished. The majority of the material for lighting these aid either airports and airports was furnished by this company.

C. T. McLaughlin, assisted by H. E. Rieker and W. A. Thayer, are in charge of the General Electric exhibit at the Chicago Show, where there is an display an airport beacon, ceiling light, type AL-11 airport flashlight, boundary lights, 100 deg. flashlight stage

optic compass, magnetic compass, gasoline gauge, and superchargers.

The following are officers of the company: O. D. Young, chairman of board, General Swope, president; E. W. Allen, vice-president; D. R. Butler, assistant vice-president; Wm. W. Treadwell, secretary; R. S. Murray, treasurer; S. L. Whitworth, controller. The home office is located at Schenectady, N. Y.

General Airplanes Corp.

The General Airplanes Corp., 350 Albert Road, Buffalo, N. Y., entered the aeronautical industry in June of this year. A. J. French is president and general manager; L. A. Long, treasurer; G. A. Trowbridge, secretary; G. MacLean Gardner, vice-president in charge of manufacturing; and A. Francis Armit, vice-president in charge of engineering.

Experimental work was started in April, 1938, and, upon the completion of the work of organization, the first aircraft production of a three passenger cabin monoplane, one of which was accepted by Canada, Richard E. Byrd let me on his Antarctic Expedition. One of these planes is on display at the Chicago exhibition.

Globe-Superior Corp.

Globe Superior Corp., Alhambra, Ill., was formed as a result of a merger in 1931 of the Globe Shirt and Overall Co., Alhambra, and the Superior Garment Co. of Columbia City, Ind. The joining of the two companies made the new concern one of the largest manufacturers of work and play clothing in the country. Seven factories are now operated by the firm.

While the Globe-Superior company did not go into full production of a line of flying clothes until 1937, the original Globe Shirt and Overall Co. marketed its first designs of flying tops in 1931. This company was acquired in 1931 with S. T. Munger, Max S. T. Munger, and J. Cox as executives. The present officers at the Globe-Superior company are S. D. Adams, president; L. L. Mosser, vice-president-treasurer; and C. H. Snyder, secretary.

The "Protexal" and the "Silver Arc" line of flying clothes are being shown by the company during the air-



Left to right—Edgar N. Galt, president, Keystone Aircraft Corp.; A. M. Kreider, president, Kreider-Reisner Aircraft Co.; E. M. Land, E. M. Land Rubber Co.

craft show. Three suits of the "Protexal" line are being featured prominently. They are the Protexal "Aviator's Suit," "Pilot's Suit" and "Ground Suit." The Silver Arc (left's) suit is featured in the exhibit of the company.

B. P. Goodrich Rubber Co.

Dr. H. P. Goodrich launched the B. P. Goodrich Rubber Co. at Akron, Ohio, in 1909. The first product was fire hose, and soon after, garden hose. Dr. Goodrich looked so strongly in the unobscured field of rubber that the company is now used to be manufacturing about 30,000 different products of rubber and rubber construction.

The first made its first airplane tire in 1912 when most planes were landing on roads. During the War, Goodrich manufactured a full line of airplane accessories and supplied the necessary forces and the Allies with observation balloons and lighter-than-air fighting material.

Today the firm manufactures a line of airplane tires, tail wheel tires, airplane tubes, airplane piston band brake covers, shock absorber disks and jacking airplanes, engine, special molded rubber goods, such as cronometers, handle grips, etc., also miscellaneous types of tires used on aircraft. Goodrich maintains a service plant with Cy Caldwell as pilot, having dealers at all the principal airports.

A selected line of the above products is shown in its booth at the Chicago Aircraft Show.

The present officers are J. D. Tate, president; S. M. Jett, secretary, and V. I. Montgomery, treasurer. Administrative offices and main plant are both located in Akron, Ohio.

Goodyear Tire & Rubber Co.

The Goodyear Tire & Rubber Co. is one of the pioneer American manufacturers of tires and rubber products. In 1910 Goodyear entered the aeronautical field by manufacturing kite and free balloons. In 1924 the Goodyear Zeppelin Corp. was organized with W. P. Latfield as president and Dr. Karl A. Goodyear, vice-president and chief engineer. Goodyear officials have reported their free kite balloons, in addition to airplane tires and accessories, 1,000 balloons, 305 non-rigid airships and 1 semi-rigid airship.



Left to right—J. H. Shaw, treasurer, Kramell Refining Co.; Francis Pope, president, The Kramell Co.; E. A. Johnson, president, Johnson Aircraft Supply Co.

The Goodyear Zeppelin Corp. was awarded, in October, 1928, Naval contracts for two 6,500,000 cu ft rigid airships. Hangers are now in course of construction at Akron to enable the fulfillment of this contract.

The firm has on display at the Chicago Show, parts for lighter-than-air craft, airplane tires and similar models. The general offices of the Goodyear Zeppelin Corp. are P. W. Latfield, president; Dr. Karl A. Goodyear, vice-president and chief engineer; and C. J. C. Henschel, U.S.N. retired, vice-president in charge of commercial affairs.

Goodson & Ferguson, Inc.

Goodson & Ferguson, Inc., manufacturer of clothing, was organized in 1921 in St. Paul, Minn., where its offices are still maintained. Richard Goodson was the first president and treasurer, and was assisted by Fred D. Ferguson, who was the vice-president and secretary.

This company entered the aeronautical industry in 1917 when it began the manufacture of far less flying suits (or suits by the U. S. Government). The firm has added to its line of clothing, and now, it is offering outdoor clothing for government and commercial pilots for use "from home to home." Goodson "Aeromax" clothing is on display in Chicago during the International Aeronautical Exposition.

The present officers are C. W. Goodson, president; J. N. Jackson, vice-president; W. W. Shuman, treasurer; and J. M. Henshaw, Jr., secretary.

Great Lakes Aircraft Corp.

Great Lakes Aircraft Corp. is one of the newcomers in the field of airplane construction, yet it began with an auspicious background. The corporation was organized by a strong building group, which recently acquired the entire Cleveland physical properties of the Glenn L. Martin Co., pioneer plane manufacturer, and will operate them through the new organization.

The Martin plant, which, under the terms of the agreement reached, has become the property of Great Lakes Aircraft Corp., is situated on a 70 acre tract of land at 35000 St. Clair St., Cleveland, Ohio. With the original buildings, constructed in 1918, and the additions made in 1927, the factory now contains a total of 80,000 sq ft of floor space. Unlimited opportunity for further expan-

men is also provided. Aside from the plant, which is one of the best equipped and most efficient in the industry, the Great Lakes company obtained a lease on the swimming beach field, to be used for training new planes. The right to manufacture all existing types of Martin planes for both military and commercial purposes was granted the Great Lakes corporation at the time of the sale. This agreement includes the right to produce the Martin "74" or the "74M-1," as it is known to the Navy, which is now using planes of this type for torpedo and bombing work. A T4M-1 without the fabric covering is on display at the Army's show. Plans of this type will later be developed for use in commercial aviation for mail, express and passenger carrying. In these planes the open cockpit construction will be substituted by an enclosed cabin.

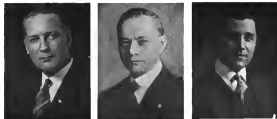
Glen L. Martin is connected with the new company only in an advisory capacity. William Robert Wilson, who is well known in automobile and banking circles, is chairman of the board of directors of Great Lakes Aircraft Corp., and C. F. Van Bicklen is vice-president in charge of sales.

Guaranteed Aircraft Hanger Co.

Guaranteed Aircraft Hanger Co. was formed in April, 1930, as a manufacturer of commercial, industrial and private hangars. The original address of the company was Jamaica, L. I., and the original officers were Francis Rogers and George Hilt.

In February, 1930, the company began the manufacture of airplane hangars. Since that time, the business of the firm in hangars has grown to such proportions that it was found necessary to purchase a plant in that one of the executives might bring in contact with the trade and at the same time overcome the criticism of Guaranteed hangars in various parts of the country. The foreign business of the Guaranteed company has also increased to a great extent and the company has contracted with the A. I. American, Inc., an export company, for the handling of all its foreign business.

A model of one of the Guaranteed steel hangars is on display at the exhibit of the company in Chicago. The present officers are Francis Rogers, George Hilt and K. Griswold. The offices of the company are situated at 138-04 Jerome Ave., Richmond Hill, N. Y.



Left to right, Jean S. Wolfe, vice president, Mornby Co.; H. B. Lundberg, president, Irvington Sorensen Co.; John C. Nolan, vice president, Maloney-Ryan Aircraft Corp.

Greer College

Greer College, founded in 1902 by Edwin Greer for training automotive mechanics, earned the field of aviation in 1927. In July, 1928, this school absorbed the Chicago Aviation and the Village Aircraft Co. It started an aircraft school, which includes both flying training and a complete ground course in airplane and engine mechanics. Capt. C. G. Bryen is in charge of the ground and shop training department and Wiley W. Meyer is chief pilot for the course. Last, Wiley Meyer was, for a number of years, a U. S. Army Air Service instructor and later trained hundreds of civilians.

The company is exhibiting at the Aeronaut Show, display of students' handwork and show views of the equipment and shops.

The officers of the school are Edwin Greer, president; J. C. Bryen, R. J. Bennett, R. N. Hoffman, H. Curright, H. McCoskirk, and W. W. Meyer. The school is located at 2024-26 Wabash Avenue, Chicago, Ill.

Hall-Aluminum Aircraft Corp.

Hall-Aluminum Aircraft Corp. has, since its inception, maintained itself in the use of aluminum alloy in aircraft construction. This development work was initiated originally in 1926 by Charles Ward Hall, president of the aluminum company. In 1919, he associated himself with Charles F. Page and T. Mahoney. The result was the formation of what was known as Charles Ward Hall, Inc., and afforded a nucleus for the present corporation, which was organized last year.

The U. S. Navy Department in 1925 became interested in the work, which was being carried on by Charles Ward Hall, Inc., at the factory in Halesworth, N. Y. Contracts were awarded the corporation at that time for the construction of two sets of metal wing panels for the HS-3 flying boat. Later the Navy awarded the company contracts for other aluminum alloy aircraft and parts, which included the T-31 in metal, wings for the TB-1 and amphibious boats for the T3M-2.

With the formation of Hall-Aluminum Aircraft Corp. the company moved into a larger factory at 201 E. Broadway Ave., Buffalo, N. Y. Since that time it has been working on two new all-metal planes for the Navy, one a patrol type of flying boat and the other a single seater

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Left to right: Stanley Partridge, Mahan Aircraft Corp.; George H. Townsend, president, Moto-Meter Co.; Eric H. Reynolds, president, Norwood Air Transport, Inc.

dayboard fighter which it is expected will be test flown early next year.

In the exhibit of the company may be seen a number of aluminum alloy parts and an airplane without covering, showing the application of these parts. The parts include original dashboards and compasses, and built up ribs. In addition standardized front and tail sections are shown.

Aside from Charles Ward Hall, the officers of the company are Archibald M. Hall, vice-president, and Mr. Page, who is secretary and treasurer. S. K. Coffey of the Aluminum Company of America, and Oleson S. Wyckoff, of the Atlas Steel Castings Co., and the officers are the directors.

Hamilton Metalplate Co.

Hamilton Metalplate Co., manufacturer of aluminum airplanes, at the same company, was organized July 12, 1927. Since that time the firm has produced several different models of the same general type. The latest is a cabin monoplane capable of carrying six passengers in addition to the pilot and a navigator. Planes of this type are constructed entirely of "Alclad," which is a new composite metal manufactured by using a core of a strong aluminum alloy with a thin layer of pure aluminum on either side. The new Hamilton "Metalplate," which is powered with a Pratt & Whitney "Horse," is on display at the exhibit of the company in Chicago. The present address of Hamilton Metalplate Co. is 530 Park St., Milwaukee, Wis. The officers of the company are Thomas F. Hamilton, president; Charles F. Smith, vice-president and general manager; Clarence S. Falk, vice-president; Hamilton Metalplate, treasurer; and William F. Pahl, secretary.

Stewart Harbison Co.

Stewart Harbison Co. were manufacturers, was founded at East Newark, N. J., in 1925. The company entered the aero field in 1928 when it began to furnish large numbers of Harbisons wire to manufacturers of aircraft. During the last two years it developed and introduced in the industry many types of streamline and square section wires.

The Stewart Harbison exhibit at the Chicago show includes streamline and square section material for radio and Army-Navy work and fittings, in addition to the

regular line of aircraft wire produced by the company.

Stewart Harbison, president, H. W. Black, vice-president, S. A. Harbison, vice-president, E. L. Durkin, treasurer, H. C. Baisford, director of sales, and J. M. Leary, mechanical representative, direct the activities of the company, which is now located at 350 Fifth Avenue, New York, N. Y.

Haskelle Manufacturing Corp.

Haskelle Manufacturing Corp., maker of plywood and headquarters at 129 S. La Salle St., Chicago, Ill., entered the aeronautical field during the World War. To date the firm has manufactured "Haskelle," "Plywood," "Aluminum Plywood" and "Durahane Plywood," which have a wide variety of uses in airplane construction. Samples of these materials are on show in Chicago, as well as airplane parts to demonstrate the use of the materials. The parts exhibited were furnished the Haskelle company by a number of well-known airplane manufacturers. The company is also showing its "Secure-Write" sign, illustrating the extent to which its products are now used in the field of transportation.

The Haskelle corporation is headed by George R. Meyersdorf, president; James R. Pilgowsky, vice-president and secretary; A. G. Johnson, treasurer; and Howard R. Thoson, assistant secretary and treasurer.

Heywood Starter Corp.

Heywood Starter Corp., manufacturer of the Heywood high pressure injection starter for aircraft engines, was organized originally at Detroit Air Appliance Corp. with headquarters at 6847 St. Paul Ave., Detroit, Mich. Last May, a reorganization of the company was effected and its name was changed to Heywood Starter Corp., under which it has been appearing since that time.

The officers of the original Detroit appliance company were S. L. McKay, president, and H. V. Willis, secretary and treasurer. Under the new plan of organization, Mr. McKay retained his position as head of the company, Mr. Willis became treasurer, and F. B. Stever was elected secretary. Edward Hughes is general manager. The present address of the Heywood company is the location it was when operating as the air appliance corporation.

The Heywood starter was introduced to the trade for the first time about a year ago. It has been well received, and, to date, it is said that 200 of these starters have been sold. The Heywood product is being demonstrated this week in booth "B-12."

Hortik's Malted Milk Corp.

Hortik's Malted Milk Corp., manufacturer of Hortik's malted milk and other malted food products, was organized in 1937. The products of the company are extensively well known, and are used extensively. Outlets of the company have been established in all parts of the world, and are used extensively. Outlets of the company have been established in all parts of the world, and are used extensively.

With the development of aircraft and aircraft engines to the point where long distance flights might be undertaken, the malted milk manufactured by the Hortik's company found a new field. Hortik's malted milk health tablets, because of the combined malt and wheat and concentrated food value, have been used by Charles D. Chamberlain, "Bud" Gurney, Ernest L. Smith, Laurence Marshall, and "Honeydew," Miss Ruth Elder, Miss Amelia Barlett, Lady Heath, Sir Hubert Wilkes and Commander Byrd.

The Hortik's Malted Milk Corp., which maintains its offices, laboratories and plant at Racine, Wis., is demonstrating the usefulness of its malted milk in powder form and the malted milk health tablets, in both the United States and abroad, at its booth in the Coliseum.

The International Derrick & Equipment Co.

The International Derrick & Equipment Co., which is now one of the largest makers of derrick boats in the world, was organized in 1925. At that time Gordon Beattie became president, H. M. Kende, vice-president and general manager, and E. R. Hines, chief engineer. In 1928, the company entered the aeronautical industry when it first introduced its heavy towers. These towers met with approval and since that time the line of aircraft products has been gradually increased, until now the company manufactures a complete line of airplane hangars, standard and buildings, flood light towers,

radio towers, mooring masts and landing light supports. The various aeronautical products made by the company at the present time are now on display in Chicago. Mr. Kende is now president of the company, Mr. Hines is general manager, and C. G. Kende is secretary. The headquarters of the company are located at 875 Madison Avenue, Columbus, O.

Living Air Chute Co., Inc.

Living Air Chute Co., Inc., was organized in 1918 and established headquarters at 323 Main St., Buffalo, N. Y., where the company is still located. The original officers were George Weiss, president and treasurer, and Leslie Lewis, vice-president and secretary. These men still hold their same position with the company.

The company began with the manufacture of parachutes for use in both heavy-duty and light-duty aerial work, and has continued to produce the most type of equipment. The parachutes developed and perfected by this company have saved the lives of more than 135 aviators, officials of first aid, and have been used in emergencies covering practically every conceivable form of airplane accident. Parachutes manufactured by the Living Air Chute Co. are now used as standard equipment by the aviation services of Great Britain, the United States and a number of other nations.

At the exhibit of the Living company in the Coliseum during the air show the complete line of "Living Air Chutes" may be seen.

Johnson Airplane & Supply Co.

The original partnership of the Johnson Airplane & Supply Co. was started in 1919 at Wilmington Pike and Patterson Road, Dayton, O., by E. A. Johnson and J. M. Johnson. The first company started as a supply company selling war surplus airplanes, engine parts and accessories. The Johnson Flying Service started operating in 1924. In 1926, the Johnson Airplane Co. was organized for the purpose of manufacturing the Johnson "Woo-Slo" engine.

The firm is said to now carry a large supply of high quality airplane supplies, selling regularly commercial models of airplanes, airplanes, deicers and jettison in aeronautical equipment. The company maintains its own

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laboratory for testing and inspecting equipment also as an aeronautical engineering staff for development of new products.

On display at the Chicago Aircraft Show are many products of the company's own development, including all kind wheels, steel wheels with and without brakes, street up-and-down indicator, safety belts and spinning wheels. The firm is said to be in the building, covering an entire block at 906 So. LaSalle Street, Dayton, O., in 1938. The present officers are E. A. Johnson, president; D. E. Denney and J. L. Stevenson.

Kendall Refining Co.

The Kendall Refining Co., which was organized in 1922, carried the aeronautical industry in 1938. The following oils have been well received, and in spite of the comparatively recent entry of the company into the field, it boasts the 25 of the 40 places leading in the recent New York to Los Angeles air derby and the 25 of the "Pittsburgh" engine, a brand recommended by the concern for use in aircraft engines.

Supplies of the Kendall oils are on exhibit in the booth of the company at the Coliseum. In addition to these, the company is exhibiting at the air show the greatest barrel, which shows every operation of the refilling of crude oil from the time it reaches the refinery until it is finished into its more than fifty hydrocarbons. A study of the book is the equivalent of a trip through the refinery, and it shows the extreme care and scientific accuracy that is necessary to refine a high grade lubricating oil.

The present officers are Otto Koch, president; H. H. Greene, vice-president; I. M. Shaver, treasurer, and J. B. Fisher, assistant treasurer. The sales office and refinery of the company are located at Bedford, Pa.

Joseph Kreitzer Corp.

Joseph Kreitzer Corp. has operated a number of years as an automobile sales and service organization at 1801 South Hope Street, Los Angeles, Calif.

The Aeronautics Division of the company was organized in August, 1935. The firm manufactures a two-seater four-place cabin plane. These planes are being built for the company's own use as well as for sale to other pilots and as support for use in night-vision flights and also for the commercial market.

On display in the company's booth at the Chicago show is one of the two-engine four-place planes.

The present officers of the company are Joseph Kreitzer, president; A. J. Edwards, first vice-president and manager of the Air Division; D. B. Schuchard, second vice-president and Otto Kreitzer, secretary and treasurer.

The office of the Aeronautics Division is now located in Room 655, Chamber of Commerce Building, Los Angeles, California.

The Kawaner Co.

The origin of The Kawaner Co. at Niles, Mich., dates back to 1903, when Francis J. Pyra, a pioneering aviator at that time, made the first all-metal plane. Shortly after the first plane was made the firm was organized with Mr. Pyra as president, a position which he still holds.

The Kawaner Co. entered the aeronautical field about the time of United States' entry in the World War. At

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that time this company manufactured all steel radars, elevators, landing and landing lights, elevators, tubes and elevators. Kawaner struts have been used on many planes, including the two-engine fighters such as No. 2 Two-Two Air which was flown in the first Ford Tour, and the Waco Ten which won the 1928 National Air Tour and the Leaning Airplane which won in Major Douglas's Pan-American goodwill flight.

In addition to Mr. Pyra there are H. H. Hittman, vice-president and treasurer; F. R. Englehart, vice-president and sales manager; and Lawrence J. Pyra, secretary. The company is featuring worldwide sales of various components from light aircraft to heavy landing gear struts at the Chicago show. It is also featuring a new product recently introduced as "Harrison Job Series."

Kreider-Reimer Aircraft Co., Inc.

The Kreider Air Service was established at Hagerstown, Md., in 1920. In 1923 Kreider-Reimer Aircraft Co., Inc., was incorporated with A. H. Kreider as president and treasurer, L. B. Reimer, vice-president and J. K. Baker as secretary. They began immediately to operate in the aeronautical field by establishing a repair shop, and manufacturing aircraft parts. Design and construction was then started on the "Challenger," a three-place open cockpit airplane.

In 1928, the Kreider-Reimer plant completed was the winner of the "Scientific American Trophy" at the Sesqui-centennial Races in Philadelphia.

The firm is exhibiting a "Challenger" airplane with split type landing gear, low-wing altimeter and a Coast engine at the Chicago show.

The present officers are A. H. Kreider, president and treasurer; L. B. Reimer, vice-president; J. K. Baker, secretary; F. R. Sailer, Jr., chief engineer. The factory and offices are located at Hagerstown, Md.

Kepone Aircraft Corp.

Kepone Aircraft Corp., plane manufacturer with headquarters in Bristol, Pa., was organized in 1926. Since that time, the company has developed a number of planes. These include the "L-14," a single engine biplane; the "L-15," "L-16," "L-17," "L-18," "L-19," "L-20," "L-21," "L-22," "L-23," "L-24," "L-25," "L-26," "L-27," "L-28," "L-29," "L-30," "L-31," "L-32," "L-33," "L-34," "L-35," "L-36," "L-37," "L-38," "L-39," "L-40," "L-41," "L-42," "L-43," "L-44," "L-45," "L-46," "L-47," "L-48," "L-49," "L-50," "L-51," "L-52," "L-53," "L-54," "L-55," "L-56," "L-57," "L-58," "L-59," "L-60," "L-61," "L-62," "L-63," "L-64," "L-65," "L-66," "L-67," "L-68," "L-69," "L-70," "L-71," "L-72," "L-73," "L-74," "L-75," "L-76," "L-77," "L-78," "L-79," "L-80," "L-81," "L-82," "L-83," "L-84," "L-85," "L-86," "L-87," "L-88," "L-89," "L-90," "L-91," "L-92," "L-93," "L-94," "L-95," "L-96," "L-97," "L-98," "L-99," "L-100," "L-101," "L-102," "L-103," "L-104," "L-105," "L-106," "L-107," "L-108," "L-109," "L-110," "L-111," "L-112," "L-113," "L-114," "L-115," "L-116," "L-117," "L-118," "L-119," "L-120," "L-121," "L-122," "L-123," "L-124," "L-125," "L-126," "L-127," "L-128," 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"L-906," "L-907," "L-908," "L-909," "L-910," "L-911," "L-912," "L-913," "L-914," "L-915," "L-916," "L-917," "L-918," "L-919," "L-920," "L-921," "L-922," "L-923," "L-924," "L-925," "L-926," "L-927," "L-928," "L-929," "L-930," "L-931," "L-932," "L-933," "L-934," "L-935," "L-936," "L-937," "L-938," "L-939," "L-940," "L-941," "L-942," "L-943," "L-944," "L-945," "L-946," "L-947," "L-948," "L-949," "L-950," "L-951," "L-952," "L-953," "L-954," "L-955," "L-956," "L-957," "L-958," "L-959," "L-960," "L-961," "L-962," "L-963," "L-964," "L-965," "L-966," "L-967," "L-968," "L-969," "L-970," "L-971," "L-972," "L-973," "L-974," "L-975," "L-976," "L-977," "L-978," "L-979," "L-980," "L-981," "L-982," "L-983," "L-984," "L-985," "L-986," "L-987," "L-988," "L-989," "L-990," "L-991," "L-992," "L-993," "L-994," "L-995," "L-996," "L-997," "L-998," "L-999," "L-1000," "L-1001," "L-1002," "L-1003," "L-1004," "L-1005," "L-1006," "L-1007," "L-1008," "L-1009," "L-1010," "L-1011," "L-1012," "L-1013," "L-1014," 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"L-1115," "L-1116," "L-1117," "L-1118," "L-1119," "L-1120," "L-1121," "L-1122," "L-1123," "L-1124," "L-1125," "L-1126," "L-1127," "L-1128," "L-1129," "L-1130," "L-1131," "L-1132," "L-1133," "L-1134," "L-1135," "L-1136," "L-1137," "L-1138," "L-1139," "L-1140," "L-1141," "L-1142," "L-1143," "L-1144," "L-1145," "L-1146," "L-1147," "L-1148," "L-1149," "L-1150," "L-1151," "L-1152," "L-1153," "L-1154," "L-1155," "L-1156," "L-1157," "L-1158," "L-1159," "L-1160," "L-1161," "L-1162," "L-1163," "L-1164," "L-1165," "L-1166," "L-1167," "L-1168," "L-1169," "L-1170," "L-1171," "L-1172," "L-1173," "L-1174," "L-1175," "L-1176," "L-1177," "L-1178," "L-1179," "L-1180," "L-1181," "L-1182," "L-1183," "L-1184," "L-1185," "L-1186," "L-1187," "L-1188," "L-1189," "L-1190," "L-1191," "L-1192," "L-1193," "L-1194," "L-1195," "L-1196," "L-1197," "L-1198," "L-1199," "L-1200," "L-1201," "L-1202," "L-1203," "L-1204," "L-1205," "L-1206," "L-1207," "L-1208," "L-1209," "L-1210," "L-1211," "L-1212," "L-1213," "L-1214," "L-1215," "L-1216," "L-1217," "L-1218," "L-1219," "L-1220," "L-1221," "L-1222," "L-1223," "L-1224," "L-1225," "L-1226," "L-1227," "L-1228," "L-1229," "L-1230," "L-1231," "L-1232," "L-1233," "L-1234," "L-1235," "L-1236," "L-123

Shortly after the organization of the company, the first "Moose" type was produced, and since that time six of these planes are said to have been evaluated. This light commercial type is on exhibition at the International Aeronautics Exposition. The present address of the company is 52 Ogden Ave., Riverside, Ill.

Moose Aircraft, Inc.

Moose Aircraft, Inc., airplane manufacturers, Moline, Ill., was organized last March. The first model produced was the "Moose," a two passenger, radial twin monoplane of the cantilevered, high wing type. This plane was with approval and has been in production for some time. Recently, the company developed the "Moose-Cat," a two passenger training plane, and the "Moose-Cat" another member of the cantilevered high wing type designed to carry six passengers. These three planes are on exhibition at the display of the airplane manufacturing company in Chicago. The present offices of the company are W. L. Velez, Jr., R. A. Lawrence and George A. Stange.

Moore-Meyer Co., Inc.

The Moore-Meyer Co., Inc., was organized in New York City on Oct. 1, 1912, by C. H. Townsend, president, H. H. Boyer, general manager and secretary, and P. L. Verder, vice-president and treasurer.

The company manufactured and introduced to the automotive industry the Boyer Motorbills. The Moore-Meyer Co. entered the auto field in 1917 and is said to have supplied 25,000 Boyer Motorbills for Army and Navy planes during the War.

Boyer Motorbills were used as the NC-4 in its 1919 trans-Atlantic flight. Colonel Lindbergh's New York to Paris flight, the Army's "Round the World Flight," Commander Byrd's North Pole flight, and many other famous flights, according to the officials.

Together with its subsidiary, the National Engine and Equipment Co., it now supplies the Army and Navy with practically all its indicators and a large number of aircraft positive gauges. Boyer Motorbills are now used by many of the leading manufacturers of commercial planes. The display at the Chicago show includes four indicators and pressure gauges.

The firm is now headed by C. H. Townsend, president;

Louis C. Kora, secretary and treasurer, and Jerry J. Tobin, vice-president. General offices are at 15 Wilbur Avenue, Long Island City, N. Y.

Moth Aircraft Corp.

The actual date of organization of the Moth Aircraft Corp. located in the Graydon Building, New York, N. Y., was May, 1928. The officers of the concern are M. M. Warren, president, E. L. Hines, first vice-president; Frank M. Smith, second vice-president; Wesley Haines, treasurer, and A. Day, secretary.

The Moth Aircraft Corp. is starting production of the "Moth," "Gipsy Moth" airplane at its plant in Lowell, Mass. It is expected that the first planes will be ready by early spring.

The company has, in addition to its own, the engineering and technical staff of the de Havilland Co. at its disposal for the reason that the Moth Aircraft Corp. has been organized principally to manufacture the British planes in this country. An imported model of the Gipsy Moth is on display by this company in the Coliseum in Chicago.

New York Rubber Corp.

New York Rubber Corp., manufacturer of belting, packing and industrial grafts of the de Havilland Co. in its division purchased the Aerobler Corp. of Chicago, together with all patents on same and manufacturing processes concerning the manufacture of its related goods.

Entry into the auto field began with the furnishing of air inflated cushions, life preservers, etc., to the Navy Department. The company recently started the manufacture of air cushions, air mattresses, plane's airplane seats and life preservers for commercial aircraft builders. A recent addition to the line is an air bed, designed for plane and ship use, which weighs only five pounds.

A complete line of all the products of New York Rubber Moth is on display by this company in the Coliseum.

Management of the firm is in charge of Joseph W. Joyce, president, E. D. Ringler, vice-president; Fred Ash, treasurer, W. C. Rogers, manager of "Aerobler" department, and H. L. Pitt, assistant treasurer. Headquarters of New York Rubber Corp. are at 79 W. 44th St., New York City.

National Air Transport, Inc.

The National Air Transport, Inc., one of the best known airline systems in the world, was organized at Detroit, Mich., on May 1, 1925. The original officers were Harold E. Coffin, president, Chas. L. Lawrence, vice-president, Eugene W. Lewis, 2nd vice-president, Wayne C. Taylor, 2nd vice-president, John H. Mitchell, treasurer, and Carl R. Frazier, secretary.

The firm entered the auto field May 12, 1928, starting with 10 air mail planes on routes in and near New York, carrying approximately 224 lbs. of mail per day from Chicago to Dallas. It is said that N. A. T. planes fly 6,000 mi. every day between New York-Chicago and Dallas. The Company started carrying express Sept. 10, 1927, and now operates 48 planes carrying 3,000 lbs. of mail and express daily.

N. A. T. has its own repair plant and maintains five divisional traffic offices. Field hangars with repair crews are at five stations: London, Washington and Richmond in the United States; London, Paris, and Rome, also have been collaborating with the U. S. Government in developing the radio beacon and plane-to-ground telephone service.

There is an exhibition at the Chicago Show, one of the N. A. T. all-steel monoplanes, and real engine planes.

The present officers are as follows: Earle H. Reynolds, president, Chas. L. Lawrence, 1st vice-president; C. T. Landreth, 2nd vice-president; Eugene W. Lewis, 3rd vice-president, and Carl Frazier, 4th vice-president, and general manager. The company is at present located at 5035 S. Cicero Avenue, Chicago, Illinois.

Norm-Hoffman Bearings Corp.

The Norm-Hoffman Bearings Corp. originated as "The Norm Company of America" in the Bronx, N. Y., in 1911. The firm first entered the auto industry through the use of its bearings in traction, wind-driven generators, etc., during the World War.

The firm manufactures ball, roller and thrust bearings to the aircraft industry for war engines, airplanes, gas turbines, superchargers, fuel pumps, oil pumps, reduction gears, inertia starters, controllable pitch propellers, centrifugal compressors, turbines, screwdrills, etc.

Norm-Hoffman bearings are used in the "Wright" "Curtiss," "Ford & Wherry," "Cessna," "Caud" "Cessna," "Cessna," "Cessna," and many other well known aviation engines. Bearings are also furnished by this firm to the leading instrument manufacturers, among which are Arrowhead Starter Co., Allison Engineering Co., DeLore-Berry, Eclipse Machine Co., Elinette Specialty Co., General Aircraft Co., Norton-McCabe Co., Norton Steel Products Co., Power Instrument Co., Smith's Shipyard Co., Springfield Machine Co., etc.

A representative line of bearings is on display at a number of the officers of the company are at Booths A-2 and A-3 at the Chicago Show.

The present officers of the firm, which is now located at Stamford, Conn., are W. M. Nason, president, C. P. Williams, vice-president, Samuel Robert secretary, H. J. Riley, assistant secretary, and N. Bell, assistant secretary.

Nichols-Bentley Airplane Co., Inc.

Nichols-Bentley Airplane Co., Inc., which was founded in 1923 by Russell Nichols and Howard Bentley, began operations by purchasing surplus Army stores of aircraft materials, engines and supplies, and marketing them at a low profit plan.

From this modest beginning, the company has grown into a half million dollar organization. The

firm now owns nine buildings, an 80-acre airport with three large hangars, a fleet of 15 airplanes and a growing stock. In addition to the business of distributing and selling aircraft supplies, which has increased steadily from the start, the company manufactures a complete assortment of aluminum aircraft products.

The first step in also manufacturing the "Barling" "ND-3," a three passenger, open cockpit, all-metal monoplane of the low cantilever wing type, which is being shown for the first time at the show. This plane was designed by Walter H. Barling, well-known aeronautical engineer. Three large factory buildings were recently completed for the Nichols-Bentley company. Machinery is being installed and the firm expects to start quantity production on the plane in the near future.

Two booths are occupied by the Nichols-Bentley company, and the complete line of aeronautical supplies needed by the concern, propellers, engine parts, materials for repair, etc., is on display. Plans for the winter are on display, besides the new plane.

Nichols-Bentley Airplane Co., Inc., is still owned and operated by Mr. Nichols and Mr. Bentley, the president and the secretary-treasurer, respectively. The present office of the firm is in English at North St., Marshall, Mo.

The Packard Electric Co.

The Packard Electric Co. was organized in Warren, O., in the year 1899, by W. D. Packard, and J. W. Packard. Upon organization it started the manufacture of automotive ignition and lighting coils and transformers.

In 1916, the firm started making ignition and lighting coils for use in aircraft. These products were used extensively in government aircraft during the World War. The company has recently established a special research department to provide the aeronautical industry with the proper coils equipment to meet the numerous requirements of aircraft and engine manufacturers. The ignition and lighting coils produced by this company are on display at the Chicago show.

W. A. Wolcott, president, D. N. Macgregor, sales manager, and L. C. Wolcott, in sales manager.

Pan-American Airways, Inc.

Pan-American Airways, Inc., was organized and began operations on Sept. 1, 1927, from Key West to Havana, in October, 1927. This line was extended to Mexico in September, 1928. During the year, there were further extensions made including Porto Rico, Niassa and Panama.

In June, 1928, the American Corporation of the Americas was organized as a holding company to finance all activities so as not to interfere with the business of the operating companies. It is planned to extend operations to 22 different companies in the Americas. The company has been successful in securing the Atlantic Coast Line Railroad, Florida East Coast R. R. and the Pan-American Airways, Inc., so that tickets can be purchased at any agency ticket office for transportation from any point in the U. S. to any point touched by the Pan-American Airways. When the \$100,000 is secured in capital at Miami, management will be such that passengers and baggage will be aboard the air transports not later than 45 min. after leaving the Pulkams.

A fleet of tri-motored amphibious airplanes with a high speed of 140 m.p.h. will go into operation at the inauguration of the first international air-passenger service in America.



Left to right: Gen. W. W. Atterbury, president Pan-American Airways; Gen. J. T. Tripp, president Pan American Airways; Gen. Spence Heath, president Pan American Airways.

Pan-American Airways, Inc., is displaying at the Chicago Aeronautic Show the first airport in the world to be built on a 100,000 sq-ft terminal, in connection with history and a map showing the system in the United States and Central and South America.

The officers of the company are J. T. Tilgh, president, J. A. Hester, vice president, J. E. McGee, vice president, and Robert G. Thach, secretary. Their offices are at 100 E. 42nd St., New York City.

Person Engineers Inc.

Spencer Heath, president of the Person Engineers, Inc., started manufacturing the first Person Aircraft propellers at 242 Grand St., Baltimore, Md., in September, 1933.

According to Mr. Heath, his past achievements include the making of the propellers for the first U. S. Army dive bomber in 1916; the first propeller in 1011 a hydro-airplane from the water; the three-bladed propellers used in naval operations, dating 1911-12-13; and the propeller used on the trans-Atlantic flight in 1914.

Person Engineers, Inc., manufactures propellers in the U. S. Signal Corps during the Mexican mission in 1916, also large quantities of its products to the U. S. and Allied powers during the World War.

Person Propellers were furnished in response to an emergency order by warship (USS) USS, R. F., for Commander's Korda's trans-Atlantic flight in 1929. Successful power-operated controllable and reversible pitch propellers were designed and tested at various and operations tests in 1929. During the past few years, research has been carried on in wood, steel, aluminum and composite materials, the last being the successful development and introduction of the Minsed laminated Wood Fibre Max-Med Propellers.

Spencer Heath is in control of the company and is showing an exhibition of various propellers at the Chicago Show.

Parker Appliance Co.

AIRCRAFT MANUFACTURERS in every part of the country are using tube couplings manufactured by the Parker Appliance Co. 10100 Bella Road, Cleveland, O. The company also produces fuel line couplers, fuel reduction, pressure relief valves, tank heaters and other accessories. The fuel distribution system is so that a complete system can be designed using Parker parts. A full line of fuel and production tube leaders is also installed in the production of the company as an aid to uniform installation of fuel systems.

Parker tube couplings are light in weight and quickly built and are so designed that a tight seal to metal joint can be made even if the tube is carefully flared. The coupling can be used as a fire in damage to the tube which also expanded below the flare by the drawing tool so that substantial strains are absorbed in the coupling seal and imposed on the barrel end of the tube. The seal of the coupling and the seal of the joint are slightly modified (the trouble strength of the seal) so that a severe and tight joint is made. Aluminum tubing can be properly joined by the use of Parker couplings.

These couplings are manufactured in many sizes from No. 2 to 36 in. O. D. (up to 36 in. O. D. for 3 in. tube). For universal location standard brass or aluminum couplings are recommended. These are made in the standard weight in 36 general shapes with many possible variations of these shapes. Special shapes also can be furnished as required.

The company has been manufacturing these products

for the aeronautical industry during the past five years. Distribution and service is being extended throughout the country.

The Phoenix Manufacturing Co.

The Phoenix Manufacturing Co. has been turning out a fire extinguisher especially adapted to aircraft use since 1921. The apparatus is turned out as a lever which is controlled by the pilot. The fire extinguishing liquid is pumped under pressure and sprayed at all points in the fuselage and engine room where fire is apt to occur. The equipment is used by both the Army and Navy and is normally used with about eight pounds and contains less than 10 lb. of liquid.

The company was organized originally in 1920 and its main offices are at 901 Broadway, Canton, O. The officers are B. H. Phoenix, president, F. B. Stogman, vice-president, A. V. Stogman, secretary, and A. B. Phoenix, treasurer. At the show the company is exhibiting a line of fire extinguishers suitable not only for use on aircraft, but also for use on land.

Parker Appliances Co.

The Parker Appliances Co., 10100 Bella Road, Cleveland, O., was organized in 1920 and immediately began the manufacture of "Parker" tube couplings. These couplings met with success, both in the military and commercial fields. They are used by the Navy department as well as by a number of the leading manufacturers of commercial aircraft. Parker fuel distribution fittings were later introduced by the Parker Appliance Co., and these also are found in many types of planes.

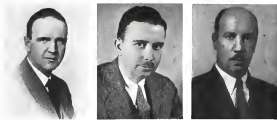
Both the tube couplings and the fuel distribution fittings made by the company are on display this week in Chicago. In addition, the tube bending and tube fabricating tools are being shown. The Parker company is owned and operated by A. L. Parker.

Pennsylvania Railroad

John Stevens, builder of the first practical locomotive, is called the father of the Pennsylvania Railroad. The original charter was issued by the State of Pennsylvania to the Philadelphia-Columbia R. Co. in 1823, and under this charter, the first division of the Pennsylvania Railroad was built by the State of Pennsylvania. This consisted of a short piece of track, which was built by the State, from Philadelphia to Columbia, Pa., and completed in 1826 at the cost of \$3,000,000. In the meantime, a new charter was issued in 1828 which first designated the route of the company as the Pennsylvania Railroad Company. The present corporation was incorporated in 1846 and extended the line to Pittsburgh by buying a private railroad from Columbia to Harrisburg, purchasing the original stock from the State and building the Harrisburg to Pittsburgh division which was completed in 1848. Progress has steadily increased during the last century, additional lines have been added to build up the now gigantic system.

Officials of the Railroad have long been active in the commercial flying as a transport development of the railroad and leading successful and banking interests (owned the Transcontinental Air Transport, Inc., for the purpose of establishing a combined air and rail route from New York to Los Angeles and San Francisco).

Prominent men in the aeronautical industry were recruited and are now exhibiting leading fields, flying pro-



Left to right—J. E. Pagan, vice-president, Stoddard Motors Co., Inc.; R. Russell Shaw, R. Russell Shaw Co., Inc.; Igor Sikorsky, vice-president, Sikorsky Aircraft Corp.

cessional, equipment and farming facilities. The route divided on a passenger to travel from New York to Columbus, Ohio, by Pullman, from Columbus, Ohio, to Dodge City, Kansas, by air; from Dodge City to Los Vegas, N. Mex., the following night by Pullman, and from Los Vegas to Los Angeles or San Francisco, by air.

A unique exhibit is at the Chicago show. The exhibit consists of an oil painting entitled "Horsemen of the Plains to the Iron Horse," (Horse and Iron Horse) and the painting entitled "Horsemen of the Plains to the Iron Horse" is being loaned to visitors by representatives of the Freight and Traffic Departments.

The present president of the Pennsylvania is Gen. W. W. Atterbury. General offices are at Philadelphia, Pa.

Precision Instrument Co., Inc.

Anticipating the demand that would soon be created for accurate aircraft instruments, Charles H. Colvin, Jr. (H. Goldsmith) and Morris M. Titterton organized the Precision Instrument Co., Inc., on March 1, 1913. They immediately entered the field by supplying aircraft instruments and operators with instruments.

Probably the best known of the products are the bank and turn indicators, climb indicator and the earth indicator compass. A few of the other products are Air-Speed Indicator, Air Distance Recorder, Altimeter, Magnetic Compass, Angle Indicator, Fuel Sight Gauge, Fuel Flow Meter, Fuel Pressure Gauge, Landing Lights, Navigation Lights, Duct, Oil Pressure Gauge, Second and Fifth Meter, Tachometer, Thermometer, Voltage Tapes, etc.

Many of the officers are attending the Chicago Show where the company has a most complete display. The major features of this display are dashboards, showing all data in uniform format of two and three-quarter inches.

The objective of the exhibition of all instrument parts in the standard sizes are overcome after rigorous efforts as the part of the engineers. A complete set of instruments is shown for the first time in this new world. Air Speed Indicators, Altimeters, Tachometers, Climb Indicators, Earth Indicator Compass, Control and Indicator Gages, Turn and Bank Indicators, Fuel Level Gages and clocks. Caliber panels are also shown designed with Air Speed Indicators and Altimeters for use in dash and clocks with large faces. These instruments are designed for use in transport planes and

are mounted in front of the cabin, making them visible from the rear seats. A working model of the earth indicator compass, showing in operation in a moving plane, is also exhibited at the Phoenix booth.

The present officers of the company are Charles H. Colvin, president and general manager; Henry F. Davis, vice-president; Herman F. Davis, treasurer; and B. Davis, secretary. Phoenix offices are now located at 754 Lexington Ave., Brooklyn, N. Y.

Pittman Aviation, Inc.

Harold F. Pittman organized Pittman Aviation in 1923, with offices at 1828 Laurel Tide Building, Philadelphia, Pa. A factory and airport was established at Willow Grove, a suburb of Philadelphia, where design and experimental work was started on experimental planes. The company to date has manufactured a number of different types including the Pittman Flyer Ship PA-1, Pittman Super Wing PA-2, Pittman Flying Ship PA-3, Pittman Flying Ship PA-4, Pittman Flying Ship PA-5, and the Pittman Super Flying Ship PA-6.

In 1927, Pittman Aviation was incorporated to operate the New York-Africa and the Atlanta-Miami routes. The New York-Africa service was discontinued May 1, 1928, and the Atlanta-Miami service to be discontinued December 1, 1928. Five subsidiary Pittman companies are operating in the States of Pennsylvania, Virginia, North Carolina, South Carolina and Georgia.

The firm will show a Pittman Super Flying Ship, type PA-6, at the Chicago Show.

Harold F. Pittman is still at the helm of the company and is continuing to maintain its office at 1828 Laurel Tide Building, Philadelphia, Pa.

The Plycor Company

The Plycor Company was organized on May 1, 1927 with the following officers: Dr. Eugene von Mauna, president; Edward von Mauna, secretary and treasurer; and Mrs. Mary E. von Mauna, general manager. The company immediately entered the new field by supplying plywood to aircraft manufacturers from its factory at 1524 So. Western Ave., Chicago, Illinois.

The Plycor Company and its associates have been manufacturing Plycor plywood of a very high quality for many

years. The European mills are used to supply the bulk of the plywood for structural airplanes. Although "Flymo" has only been known to the American industry since 1937, it has been adopted by a number of our largest airplane builders. This firm has extensive facilities for producing plywood. The Flymo quality plywood is made with one board on one side while the standard quality is made with one board on one side and two boards on the other.

The general manager states that the company has planned, during the coming year, to put on the market plywood with both one and eight faces.

The company is exhibiting at its booth in the Chicago Aircraft Show samples of its high plywood.

The present address and the officers are the next.

Pratt & Whitney Aircraft Co.

The Pratt & Whitney Aircraft Company was organized at Hartford, Conn., in August, 1925. The original officers, F. B. Rossier, president, and G. J. Mead, vice-president, immediately started research and experimental work on the present "Hornet" and "Wasp" aircraft engines. The "Wasp" engine was installed in both the land plane and airplane which holds the world's altitude records. They are now standard equipment on Army single and two-engine fighting planes. Pratt & Whitney engines are used by the Boeing Air Transport over the Chicago-San Francisco contract air mail route.

The officers of the company state that they originally started the firm to build up a supply of engines only in the U. S. Government has now furnished engines to many of the leading commercial aircraft builders. Pratt & Whitney engines hold 12 world altitude and speed records.

The Pratt & Whitney Aircraft Co. occupies a large middle space in the south end of Central Hall at the Chicago Aircraft Show and to this approximately 800 ft. of space is exhibited the Wasp, the Hornet, the reconnaissance Hornet and a representative stock of the parts showing the careful workmanship and intricate finish of the engines. Powermost among these parts is a crankshaft and connecting rod assembly, complete with pistons, assembly points and propeller hub. This gives the public an idea how the radial engine works and at the same time shows engineering authorities the fine points of the crank-

shaft and connecting rod design provided in the construction of high-powered radials. The crankpin in design is of the latest type and incorporates all the new features developed by the Research Department of the Pratt & Whitney Company. The most notable external features are those having to do with cylinder and crankpin assembly devices.

The 12 world records which the "Wasp" and "Hornet" have established are graphically described by a background of picture panels which also show the part taken by the organization in commercial air mail and transport work.

The present officers of the company are F. B. Rossier, president, G. J. Mead, vice-president, and C. W. Bond, secretary and treasurer. The factory is located at 630 Capital Avenue, Hartford, Conn.

Poey Manufacturing Co.

The Poey Manufacturing Co., Hingham, Wash., was organized 1909 with J. V. G. Poey as president and manufacturer and J. V. G. Poey as treasurer. This company entered the aeronautical industry in 1921 when it introduced Atlas spruce as material for wing beams. The firm has added numerous spruce products to its line and now it manufactures a complete line of spars, ribs, aluminum, aluminum, cap strips, bending plates and spruce sections. The company is exhibiting its line at the College in Chicago during the International Aeronautical Exposition.

In the design of the company that it has given weight to many world altitude records including the "Spirit of St. Louis," the "Pride of Detroit" and the "Woolabee." Mr. Poey is now treasurer and manager and H. O. Galloway is work's manager and secretary.

Parox Company

Parox Company, Division of Compressed Gas Corp., was organized in 1910, and has been manufacturing Parox welding and cutting torches and regulators, together with all equipment. In 1923, the company entered the aeronautical field, featuring the Parox "DOP" torch equipped with a special Douglas front and tip.

This product is especially adapted for aircraft work and has been used exclusively in the industry since it was

first introduced. Parox Company is also responsible for the application of "Stalcoite," which is an extremely hard metal, to tail wheels. In an exhibit in Chicago, the company is displaying Parox torches and "Metal Master" regulators.

The original officers of the concern are still at the helm. They are C. O. Egerson, president, W. E. Fowler, vice-president, and J. C. James, secretary. The headquarters of the Parox Company are located at 2125 Main Street, Denver, Colo.

Pyrone Manufacturing Co.

The Pyrone Manufacturing Co. was incorporated with offices at 35 West 34th St., New York City, in 1909. The officers, Peter L. Wilbur, president, George M. Shaw, vice-president, Otto Schep, treasurer, and Edward H. Davidson, secretary, started at this time the manufacture of "Pyrone" fire extinguishers in its factory at 445 East 34th St., New York.

"Pyrone" was first used in the air field in 1917. These extinguishers were included in the equipment of Commander Rod's trans-Atlantic flight in 1931, Commander Rod's Arctic and trans-Pacific flights and are installed in the three planes of his present Antarctic expedition. Pyrone extinguishers are now the standard equipment of many commercial aircraft builders.

Besides the internationally known standard one-part, double action Pyrone fire extinguishers, the Pyrone company has now perfected two special pressure type, remote control airplane extinguishers. They were designed for lightness, dependability, efficiency and ease of operation, with complete control of the Pyrone fire extinguisher liquid. This manufacturer a type of Pyrone hand sprayer equipment for all hazards, also automatic Fluorone (toxic) Aerostators for manufacturing air field and other aircraft protection.

The company has an extensive complete line of fire equipment suitable for the protection of all fire hazards in the aircraft industry at booth X-47 in the Chicago Show.

Officers of the company, which is now located at 501 Belmont Ave., Newark, N. J., are E. J. Waring, vice-president, and E. A. Clapp, secretary and treasurer.

Quaker State Oil Refining Co.

Quaker State Oil Refining Co. was organized at Oil City, Pa., the present address, on June 1, 1913. The first manufacturers Quaker State medium and heavy engine oils and a line of greases. Of these products, the triple-distilled engine oils are recommended by the company for use in aircraft engines. A complete display of Quaker State products are exhibited at the Chicago show. Present officials of the company are S. Mower, president, J. D. Barry, vice-president, G. H. Houser, secretary, and C. B. Barry, treasurer.

Rand McNally & Co.

Rand McNally & Co., one of America's oldest commercial map engravers and publishers, was organized by Wm. H. Rand, president, and Andrew McNally, vice-president, in 1864. The first activity of Rand McNally & Co. was the operation of a job-printing office at 345 North Park St., Chicago, Ill. Map-engraving and printing gradually increased with the firm until the advent of the automobile caused this department to be the most important line of endeavor.

Rand McNally maps have been used by aviators for many years. At the present time, the firm manufactures maps for soldiers, sailors and maps for aviation en-

thus, and air passenger tickets and advertising folders. The exhibit at the Chicago Show includes aviation maps, air passenger tickets and advertising folders for air lines and various companies. The company is sponsoring the Show's new series of State Air Travel Maps, the first of its kind ever published. This series will include a circular map of every State showing leading fields, lesser fields and giving much other valuable aeronautical information.

The officers of the company are H. B. Cline, president; F. L. McNally, vice-president; Andrew McNally, secretary; and George Houser, treasurer. The present address is 536 South Park Street, Chicago, Ill.

R. A. Roswin

R. A. Roswin has been known in the lumber, coal and petroleum products business in Salina, Kansas for a number of years. Although interested in aviation during the chronic, he has only been actively engaged in the aviation field since June 20, of this year. At this time, he secured Ford Langford, formerly of the Tread Air Manufacturing Co., and started experimental work on an open cockpit biplane.

Mr. Roswin is showing this plane at the Chicago Show. Immediately after the show, additional machinery will be installed and production will be started on this model. The Engineering Staff with Ford Langford, as chief engineer, and J. F. Clark and Wm. Gaschman, as assistant engineers, are now working on the design of a larger cabin airplane to be put into production in early 1939.

To date, the enterprise is owned by R. A. Roswin, whose factory is located at 345 South Park Avenue, Salina, Kansas.

Robertson Aircraft Corp.

The original officers of the Robertson Aircraft Corp., a flying service organized in St. Louis, Mo., on April 25, 1929, were Maj. William H. Robertson, president; Frank Robertson, vice-president, and Harry H. Perkins, secretary and treasurer. This firm started the air mail service in 1925 when it secured the mail contract between St. Louis and Chicago in May of that year. A passage log over the route route was started on Aug. 26, 1926.

The firm was continued on November 1 of this year as a part of the Universal Airlines. F. Robertson is now the president while Mr. Perkins is secretary and George Schorberg, treasurer. The company has a booth at the International Aeronautical Exposition in Chicago where all pilots are registered for service may be obtained.

Russell Parachute Co.

Russell Parachute Co., manufacturer of the Russell "Laba" parachute with headquarters at 1839 Kirtner Boulevard, San Diego, Calif., is exhibiting its line of parachutes, lanterns and parachute items at its display in the Coleman.

This company was organized in December, 1935, with H. R. McLeslie as general manager and J. M. Russell, engineer. The first actual production of its first parachute, Series H, 1936. Since that time, the company has added parachute flares, lanterns and also new targets to its line.

The Russell parachute is now used extensively in commercial aviation. A number of these parachutes have been used by the Army and Navy for test purposes. In Europe, the business is going on as rapidly as the Russell company located the British Royal



Left to right—Maj. Frank Robertson, vice president, Robertson Aircraft Corp.; R. A. Roswin; J. M. Russell, vice president, Russell Parachute Co.

Princeton Co. of London, England, to manufacture and sell the Lobe parachutes to the European market.

The present officers of the American company are H. R. McCintock, president; J. M. Russell, vice-president; and C. C. Temple, secretary. The address is the same as formerly.

John A. Roehling & Sons Co.

John A. Roehling & Sons Co., was originated by John A. Roehling in 1840, and since that time, his manufacturing and engineering firm has grown to become one of the largest in the world. Mr. Roehling entered the wire field approximately 25 years ago by supplying wire to the power lines and aircraft industry. This firm came to the front by its large production of wire aircraft products for the United States and Allies during the World War. Among its developments are fused balloon cables with telephone wire centers for communication with captive balloons, mooring lines for larger dirigibles, sewing wire for the welding of modern fuselages made of chrome molybdenum, suitable wire for landing and for aircraft aerials, also special shielded power, ignition and lighting cables.

The exhibit at the Chicago Show includes all of the company's wire aircraft products.

The present officers of the company are F. W. Roehling, Jr., president and treasurer; W. A. Anderson, vice-president and general manager; Siegfried Roehling, 2nd vice-president; A. C. Cooley, secretary and general sales manager; F. W. Bunn, chief engineer; and J. W. Kapp, advertising manager. The address of the firm is at Trenton, N. J.

Scintilla Magneto Co., Inc.

In 1904 the Scintilla Magneto Co., was organized by a group of engineers in Solothurn, Switzerland, in a result of an emergency created by the outbreak of the World War. Success attended the efforts of the company and in 1903 it had won a prominent place in the record of European performances. In 1921, the Scintilla Magneto Co., Inc., was formed with capital and laboratory in New York City, and by 1923 the popularity of the Scintilla Aircraft Magneto had been well established.

Following the acceptance of the magneto by the United States Government and the aeronautical industry, it became essential that a factory be established in this country.

The American-owned and operated factory of the Scintilla Magneto Co., Inc., started operation at Selkirk, N. Y., in 1925. The first American-made Scintilla Aircraft magneto was delivered in November, 1926. In 1932, the firm supplied a large magneto for Wright "E" engines. At this time, official tests that they are supplying approximately 95 per cent of the quantity used on American aircraft.

The company's exhibit at the Chicago Show consists of a display cabinet upon which are mounted a Type V, M-24 Scintilla Aircraft Magneto, which is the typical equipment of the Wright "Whirlwind" "C" and "D" engines; the Pratt & Whitney "Wasp" and "Blanca"; and other nine-cylinder aeronautical engines. Also a type MN 7-D Scintilla Aircraft Magneto which is the typical equipment of "Kluge," "Bertha," the "Wieser" "Scout," the "Aerial" "Comet" and "A" type. These two magneto are operating and delivering high tension current to spark gaps.

In the center and slightly to the rear of these two magneto, placed on a pedestal, is the new Scintilla Victor Double Aircraft Magneto, Type SC. This magneto is also in operation delivering high tension current to two

single spark gaps. There are also various type magnetos and their parts displayed in the rough, semi-finished and in a finished state. Switches, and other ignition equipment are also on display.

The present officers are W. H. Pack, president; H. H. Hesse, vice-president; T. Z. Fagan, vice-president; and G. E. Stenert, secretary and treasurer. The company's address is Selkirk, N. Y.

S K F Industries, Inc.

S. K. F. Industries, Inc., was organized by a group of engineers at Gothenburg, Sweden, in 1918, when the manufacturing of S. K. F. ball and roller bearings was started. The corporation now has 10 factories located in the United States and foreign countries. It has four research laboratories, in four cities, and its own plants in Sweden, from which the wood comes to make Swedish charcoal steel. From the time the iron is taken from the mine, it is under constant supervision until the finished bearings are completed.

S. K. F. bearings are said to have been used in the test field since the construction of the first aircraft engines. Their use has been standardized by a number of the leading aircraft engine manufacturers. These bearings have contributed to many of the speed racing flights, including trans-Atlantic flights by planes and dirigibles. Four hundred seven S. K. F. bearings were on the engines that propelled the Graf Zeppelin, according to officials of the company. Numerous types of aviation equipment and accessories are on display in which S. K. F. ball and roller bearings are used in both "B-27" and "B-28" at the Chicago show.

The corporation's officers are W. L. Bert, president; S. B. Taylor and E. F. Kung, vice-presidents; R. H. DeMott, sales manager; and C. H. Bore, secretary and treasurer. General offices are located at 401 East 34th St., New York, N. Y.

Screw Machine Specialty Co.

The Screw Machine Specialty Co., 214 W. Grand St., Chicago, Ill., manufacturing and distributing three products for some time, turned its attention to the aeronautical field a little over a year ago. Activity was started by doing special work but it was soon discovered that a market for standard forged and built machine parts.

Quality production was started on these and the products found a ready sale in the industry. Since that time the company has been working on a number of other items including the Ohio landing struts, landing wheels for replacing tail wheels, ball and socket and universal joints, streamline hub caps, cooling struts, and stabilizer adjustments. A complete line of these products is on display at the International Aeronautical Exposition in Chicago.

B. Russell Shaw Co., Inc.

The B. Russell Shaw Co., Inc., aircraft engineers and contractors, of 1604-1606 Avenue Building, St. Louis, Mo., was incorporated August 1, 1927, by L. D. Stouffer, H. Russell Shaw and A. Y. Shaw.

The company's activities in the area field started in 1928 with the manufacture of aeronautical instruments and planes. During the last several years, the company has directed and constructed a number of airports and air terminals throughout the United States.

This firm is showing a modernistic model of an air



Left to right—Edward Stratos, Stratos Aircraft Corp.; H. L. O'Neil, vice-president, Stratos Motor Design Co.; H. E. Mays, vice-president, Stratos Motor Design Co.

terminal. The display shows all improvements, the unannounced in design and the buildings show the present historic style of architecture.

The company is organized by its original officers, H. Russell Shaw, president; L. O. Swisher, vice-president; and A. Y. Shaw, secretary and treasurer.

Stratos & Holke A. G.

Stratos & Holke A. G. was organized in 1946 by Werner von Stratos. The address at the company at that time was Berlin-Schneewitz, Germany. In 1946, the concern first entered the aeronautical industry when it constructed a dirigible. In 1942 the attention of the company was turned to aircraft engines. The first engine produced by the concern was a five-cylinder rotary. This was followed in 1914 with a nine-cylinder engine, which developed 110-115 hp. Later an 18-cylinder and an 11-cylinder engine were constructed. The present types of static radial engine manufactured by Stratos & Holke were developed in 1928, but were not tested and placed on the market until 1929.

Stratos and Holke recently applied Dr. K. G. Frank, consulting engineer with offices at 25 West 51st St., New York, N. Y., as general representative to handle all the business of the company in the United States. Dr. Frank exhibited the engines made by Stratos & Holke this week at the aircraft show. Two new engines are on display. These are the "5b 13" and "5b 14," which have five and seven cylinders respectively. They are similar in design and construction to the "5b 10" and "5b 11," except that they have an improved cylinder with a bore about 1/4 in. larger than the earlier types. The "5b 13" and some larger engines developed by the German manufacturer are also on exhibition.

Sikorsky Aviation Corp.

Sikorsky Aviation Corp. was organized by the present officers: A. C. DeLorenzo, president; W. A. Bury, vice-president and production manager; and Earl Sikorsky, vice-president and chief engineer, in 1928. Although acquired and given its title in the present year, the company has been operating in the United States for several years. Earl Sikorsky, who leads his name to the organization, has enjoyed a

long and active career as European aeronautics. The history of Mr. Sikorsky's aeronautical activities started in Russia and date back to his early experiments with helicopters and his first planes the S-1, S-2 and the S-3, during 1908-09-10.

In 1902 he was in Paris receiving the highest award in the Moscow Aviation Exposition with his S-4 plane. Also winning in the Fall of the same year, the first prize in the Petrograd Military Competition with the S-5 plane. In 1913 he began building multi-engine planes which, as improvements were added, increased in size until flights were made by a four-engine plane of 17,800 lb. gross weight. During the U.S. Mr. Sikorsky furnished planes to the Russian Government. He came to the United States in 1919 and in 1923 organized the Sikorsky Aero Engineering Corporation.

A number of plants were built by this organization and it was acquired by the newly formed Sikorsky Manufacturing Corp. in 1925. This company moved its quarters from Roosevelt Field, L. I., to the present location at College Point, L. I., where it now occupies a building of more than 40,000 sq. ft. Many models of single and multi-engine planes including land planes, seaplanes and the Amphibians have been built by the company during the last three years.

An Amphibian type S-38 is on display at the Sikorsky booth at the Chicago Aircraft Show.

Smith Welding Equipment Corp.

Smith Welding Equipment Corp. is a well-known auto manufacturer of all types of Oxy-Acetylene welding and cutting equipment. About 35 years ago Elmer H. Smith organized the Northern Welding Co. for the manufacture of "Victory" torches. The firm was purchased in 1916 by a group of eastern capitalists and the name was changed to Smith's Investment Inc. Under this name the firm continued to prosper and in December, 1927, the firm was again reorganized under the name of Smith Welding Equipment Corp.

In 1930 the company created the first air and pre-heating torch. This in 1932 it introduced "A-Mid-Gas" a special flux for welding cast iron with bronze. At the present time the firm manufactures all types of welding

and cutting out, soldering equipment, carbon heating assembly for use in engines, acetylene generators, welding regulators, welder's glasses, and fuses for use in welding or soldering all types of metals. The company also has a line of instruction.

A selection of the products of the Smith Welding Equipment Corp. is being exhibited at the International Aeronautical Exposition in Chicago.

Snapp-On Wrench Co.

When this company was founded in 1926, it organized and introduced an entirely new idea in wrench equipment. These tools were immediately accepted by the automotive industry because of their greater adaptability to intricate and difficult nut turning operations. The engineers of the firm, after a careful study of the wrench requirements for the efficient assembly and maintenance of airplanes, have recently developed many special wrenches to meet the individual wrench needs of various large companies in the industry. These new tools include special types of Snapp-On Wrenches and Bananet wrenches.

Branch warehouses and offices are now located in twenty-six of the principal cities of the United States and Canada with an export department in New York.

Snapp-On socket wrenches, Elze Point Boxcocks wrenches and other quality hand tools are now being shown at the Chicago Show.

The Snapp-On Wrench Co. is managed by Stanton Palmer, president; N. L. Turble, vice-president and sales manager; Jess. Johnson, vice-president and treasurer; and W. A. Schreiner, secretary.

The company now has three manufacturing plants in Milwaukee, Wis. The general offices are at 34 E. Jackson Blvd., Chicago, Ill.

Simplex Aircraft Corp.

The Simplex Aircraft Corp. was organized by a group of prominent Ohio business men on Feb. 12, 1935, at Delaware, O. E. J. Allen is president, P. W. Allen, vice-president, and G. H. Roberts is secretary-treasurer.

This firm manufactures the "Hot Arrow" monoplane which is built in two models—an open plane and a solid plane. Two planes are being exhibited by this company at the Chicago show.



Left to right: Stanton Palmer, president, Snapp-On Wrench Co.; Jess. Johnson, vice president, Standard Oil Co. of Indiana; Lloyd Starnes, president, Starnes Aircraft Co.

A. G. Spalding & Bros.

A. G. Spalding & Bros., well-known manufacturer and retailer of sporting goods, was founded in 1875 by the late A. G. Spalding, and Albert Spalding. Headquarters were established in Chicago, Ill., and the company began operations. In 1912, the concern entered the aeronautical field with the introduction of its first helmets. Since that time, the line of aviation equipment manufactured by the company has been expanded continually and now includes visors and winter flying suits, helmets of all varieties, face masks, goggles, leather gaiters and mittens, the Spalding "Non-Sink" coat and the Non-Sink suit, leather coats and vests, waders and boots.

The aviation business of the company grew to such proportions that a separate aviation department became necessary. This division is now presided over by H. B. Hart. The present officers of A. G. Spalding & Bros. are: John W. Carson, president; Russell Spalding, vice-president; C. F. Robbins, vice-president and Albert Spalding, chairman of the board of directors. Albert Spalding was originally vice-president and A. G. Spalding, president. The general offices of the company are now situated at 105 Nassau St., New York, N. Y., and branches are maintained in the principal cities of the world.

The Spalding company has exhibited its line of aviation equipment in the most important of the world's shows that have been held in the last few years. In its booth at the Chicago show, the latest creations in aviation clothing may be seen.

Starnes Aircraft Co., Inc.

The Starnes Aircraft Co., Inc. was organized on Jan. 17, 1926, at Tulsa, Okla., with W. G. Skelly as chairman of the board of directors; Willis C. Brown, president, and F. T. Hopp, secretary-treasurer. This firm is the outgrowth of the Mail-Covered Aircraft Co. which was organized in 1922.

A new plant was constructed this past summer which, it has been said, is one of the most modern and complete commercial aircraft factories in the United States. The Starnes airplanes will be manufactured in this factory. In June, 1932, the firm obtained North American manufacturing and distributing rights for the Walter air cockpit, radial engine which is made at Piquette, Cren-

Shoven. This type of engine has, in the past two years, established new world's records. Plans are under way for additional subjects to be used in the manufacture of the Walter engine in this country.

The company is exhibiting two Sparan biplane, model C-3, and three Walter engines, the five, seven, and nine cylinder models. In addition, it is showing airplanes and engine parts in this display at the Chicago show.

Standard Oil Company of Indiana

The Standard Oil Company of Indiana is an old established company. This firm, which has been producing lubricants sold not only to the producers from the crude source and oil for many years, but has identified with the new industry almost since the beginning of man's first flight. Standard airplane engine fuel and lubricants and a line of greases are shown in Booth "Y-2" at the Chicago show.

The corporation purchased the "Standard", a Ford three-cylinder plane, which was built in Russia long ago, in Dearborn, Mich., in Chicago, Ill., on May 21, 1935, the same day that Col. Charles A. Lindbergh landed at Le Bourget Field, Paris, France. The plane is used by the officials of the company to save the time which would be necessary were it to arrive from the other side of transportation. The plane is used also to advertise the aviation department of the company. The Standard Oil plane has flown in the 10-mi. period from May 21, 1935, to October, 1935, 70,694 mi. and has carried 5,984 passengers. A brief history of the company at the Chicago Standard field, which houses the Standard and also the company's Land biplane.

The present officers of the Standard Oil Company of Indiana are: Robert W. Stewart, chairman of the board of directors; Edward G. Seibert, president; Benjamin Perle, Allen Jackson, R. H. McElroy, and E. J. Redick, vice-presidents; Anne Hall, general manager and sales director; R. E. Humphreys, director and assistant general manager of manufacturing; L. L. Stephens, director and general counsel, and C. J. Berfield, director and treasurer. General offices are located at 950 South Michigan Blvd., Chicago, Ill.

Star Aircraft Co.

The Star Aircraft Co., Bensenville, Ill., was organized in May, 1928. John Kane is president; "Bibi" Parler, vice-president and general manager, and John Kane, secretary and treasurer.

The company has been conducting extensive flight tests of a two passenger cabin monoplane which it built during the past summer and it is expected that actual production will be started in January, 1937. The officers of the firm expect to finish on the average of five airplanes a week after production has been started. The plane is known as the "Cavalier" monoplane.

The Star Aircraft Co. is displaying the Cavalier at the International Aeronautical Exposition in Chicago.

Standard Steel Propeller Co.

Standard Steel Propeller Co., airplane propeller manufacturer, which maintains its factory and general offices at 221 West 7th St., West Homestead, Pa., was incorporated in 1918. It commenced the manufacture of propellers, similar in design to the types now being produced, in 1921. The products of the company have won six great awards and are now used quite extensively. The

progress of the Standard Steel company, made from the merits of its products, is said to be due largely to the ability and engineering of Harry A. Kneeling, who has been the general and general manager of the firm since it was first incorporated.

Standard Steel Propeller Co. is occupying two booths at the International Aeronautical Exposition in Chicago. On display show may be seen a three-bladed propeller suitable for use on a Pratt & Whitney "Wasp" engine. Besides this, the company is exhibiting the original propeller used on the Lindbergh Vega "Vandee Double" in making its record breaking flight from Los Angeles to New York. Several standard propellers for Wright "Whirlwind" engine, Curtiss O-3-C and other known power engines are also on display.

Stearman Aircraft Co.

The Stearman Aircraft Co. commenced building planes at Vandalia, Ohio, on Oct. 1, 1926. The aviationists who founded the organization were Lloyd Stearman, president; Mark Shurt, vice-president; George Ely, secretary; Lewis G. Stearns, assistant secretary, and Fred D. Hoyt, treasurer.

A little over a year ago, the factory was moved from Vandalia to Wichita, Kansas. When first organized, the company produced one Stearman biplane per month, employing a force of only eight men. The company is now building two models of Stearman planes, the C-1, which is a standard open cockpit biplane, and the C-3M, which is a conversion of the open cockpit model to accommodate a full C-3M model is now being used by five contract mail operators. The Stearman Co. is now building three light aircraft planes for the Robertson Aircraft Corp. of St. Louis. These planes will accommodate four passengers and 520 lb. of mail. They will be powered with a Wright Cyclone engine. High-speed planes are also being constructed for Varsity Air Lines, these models being exclusively mail carriers.

The present factory has floor space of 40,000 sq. ft. and four planes are produced each week by the 190 employees.

The Stearman Aircraft has an exhibition a Stearman biplane C-3M model, and a Stearman mail plane at the Chicago Show.

Stout Metal Airplane Co.

Stout Metal Airplane Co., plane manufacturer of Dearborn, Mich., was organized by the Ford Motor Co., well-known maker of automobiles, trucks and masters with headquarters at Dearborn, Mich., Aug. 1, 1932. Since that time the airplane manufacturing company has been operated as a division of the Ford company.

The first model produced by the Stout company, after the acquisition by the Ford Motor Co., was the "AAT," a transport with monoplane of the high wing type, with a track wing section. Plans of this type, which are still in production, are now in use on a number of airlines throughout the country. The AAT is constructed entirely of duralumin, and is powered with three Wright "Whirlwind" engines. It has a capacity of from 10 to 12 passengers.

Recently, another model was added to the Stout line. The new type is known as the "5-AT," and is quite similar to the other model, except that it is powered with three Pratt & Whitney "Wasp" engines and carries six

from persons; fourteen passengers, the pilot and a flight mechanic. In addition, there is a baggage compartment, a toilet and washroom. Predominant on both models, which are on display at the Detroit show, is a room to be occupied at the Detroit plant at the Detroit Metal Airplane Co.

Edual D. Ford is president of the Stout company. With him, in charge of its operations, are W. B. Mayo, vice-president, and directing local, W. B. Stout, vice-president and J. B. Craig, secretary.

Stinson Aircraft Corp.

Located at Northville, Mich., is the Stinson Aircraft Corp. which was organized June 15, 1926, by its present officers, Edward Stinson, president; Henry D. Hoad, vice-president; V. A. Mann, secretary, and Richard Pitt-Greaves, treasurer.

The first aeronautical activities of the firm began with the building of the first Stinson-Detectors, although its president, Edward Stinson, has been active in aviation for more than 12 years.

The company is said to have built the first cabin plane with a starter, wheel brakes and cabin heaters. The dependability of Stinson built planes has been demonstrated by the flight of Brock and Stinson from Detroit to Tokyo, Japan, in the "Tide of Detroit" and many other notable flights that are now aviation history.

The Stinson Aircraft Corp. has designed and built to date five different models, the SM-10, the SM-11, the SM-12 and the Stinson Junior SM-13.

Two models are on display at the Chicago Show, the SM-11, which is the large cabin plane, and the Stinson Junior SM-13.

Stromberg Motor Devices Co.

A complete display of Stromberg Carburetors is on exhibition in the Stromberg booth at the Chicago Aircraft Show. The Stromberg Co. entered the automobile industry by supplying carburetors to the automobile manufacturers in 1907.

Stromberg carburetors have been standard equipment on many of the well known automobiles during the last 20 years. The firm entered the aero field in 1917 by supplying airplane carburetors to engine builders during the World War. This firm has developed a number of improved carburetors during the last few years and is now supplying many commercial manufacturers and jobbers selling to the aeronautical industry.

The present are the original officers of the company: C. W. Stinger, president; W. L. O'Neill, vice-president, secretary-treasurer. The administrative offices are at 65 East 25th St., Chicago, Ill.

Summers Tilling Co.

The Summers Tilling Co. of Bridgeport, Pa., began the manufacture of stainless tubing at Philadelphia in 1899. T. M. Summers, the active partner, was in charge of the business. The first manufacturers nickel alloy, brass, steel, aluminum, brass and copper tubing. In 1916, the firm began supplying special tubing to airplane and engine builders. In this year, it added a new unit to the history to house the aircraft tubing department of the business. A second unit, an inspection department and a warehouse for stocking fer-

rished areas of aircraft tubing, was added during the next few years. Early this year, another addition to the plant was made and now the concern is working both day and night shifts.

The management of the firm reports that, with the present equipment and personnel, the company is prepared to produce in 1938, 12,000,000 ft. of aircraft tubing.

Stainless steel, aluminum and copper tubing is being displayed at the Chicago Show.

The business of the Summers Tilling Co. is directed by S. L. Gabel, president; N. H. Wolf, manager; E. V. Gabel, secretary-treasurer; W. H. Baker, superintendent; H. C. Koser, assistant general

Supreme Propeller Co.

The Supreme Propeller Co. was originally organized as the Standard Propeller Co., in Washington, D. C., in 1903. In 1912 it moved to St. Louis, Mo. In 1917, upon the entrance of the United States into the World War the firm was reorganized as the Stinson Propeller Co. and moved to Dayton, O. At that time the company, in conjunction with the U. S. Government Aviation Experimental Station, McCook Field, manufactured all the experimental propellers for the Army before the type were placed in production.

On June 15 of the present year, the company moved to Wichita, Kans., and was again reorganized under the name of Supreme Propeller Co. George H. Sheffell is president; C. A. Nell, vice-president; A. B. Stauden, treasurer; M. J. Stone, secretary and general manager, and J. J. Stone, assistant secretary and general manager.

Several "Supreme" propellers of wooden construction, and of several different types and designs can be seen at the exhibit of this firm in the Coliseum, Chicago.

Swallow Airplane Co.

The present Swallow Airplane Co., of Wichita, Kansas, was taken over in 1927 by a number of local business men, and Victor Ross was placed in charge as general manager. The original company was organized in 1917 by E. M. Laird, who at that time began the manufacture of the Laird Swallow. The first Laird Swallow was put on the market in 1920. Since that time more than 300 planes have been built by the company. With the installation of the company by its present officers, improvements were made on the plane and it became known as the "Swallow."

The Swallow is an open cockpit three-place biplane, a number of which are now being operated in practically every State in the Union. The factory was considerably enlarged in January, 1938, and to date the production has increased to 12 planes a week.

Two Swallow planes, one with a Wright Whirlwind engine, are being exhibited at the Swallow booth at the Chicago Show this week.

The management of the company is in the hands of W. M. Moore, president; J. W. Craig, vice-president; Victor H. Ross, secretary-treasurer and general manager. The factory is located on the company's airport about ten minutes from the business center of Wichita.

Suckley Aircraft Corp.

The Suckley Aircraft Corp., a division of the O. E. Suckley Corp., was re-incorporated under the State laws of Michigan on March 26, 1937, by O. E. Suckley, president



Left to right—S. J. Stone, assistant secretary, Supreme Propeller Co.; S. L. Gabel, president, Summers Tilling Co.; Victor H. Ross, secretary-treasurer, Swallow Airplane Co.

and general manager, Geo. W. Handcock, secretary and treasurer, and E. O. Holmgren, vice-president. The original company, as [illegible] corporation, began activities on June 16, 1903, in mechanical engineering and experimental work. In this field the company is best known as the creators and manufacturers of their Hydro-aero Drive for Dismantlers.

Since entering the aero field in 1927, the aircraft division has developed and built the SM-3 three-cylinder, radial, air-cooled aircraft engine, also the SM-2 aircraft engine of the same specifications. Experimental work is being done on the SM-7, a seven-cylinder engine of higher horsepower. During the last year, the Suckley Aircraft Corp. purchased the Miles Aircraft Corp. of Wing, Mich., and is now producing the "Flying Dutchman," a low-wing monoplane.

Two Suckley engines, the SM-3 and the SM-2, and a "Flying Dutchman" monoplane are displayed in the Suckley Aircraft Corp. space at the Chicago Show.

The company has two more offices and factory in Holland, Mich., and the present officers are O. E. Suckley, president and general manager, A. H. Wroden, vice-president and Geo. W. Handcock, secretary and treasurer.

Taylor Instrument Companies

Taylor Instrument Companies has been manufacturing aviation instruments since the founding of the organization at Rochester, N. Y., in 1894. The company's interest in aeronautics was first shown in 1915 when it submitted an altimeter, as crude as the airplanes of that day, in the Army authorities at San Diego, California.

Instrument panels were at that time underdeveloped and the altimeter was mounted on a strut near the pilot. So successful was its operation that Taylor Instrument Companies received the first order for altimeters ever placed by the Army.

The company was into forced protection at the beginning of the War and is a short time Taylor altimeters were in practically all the training and combat planes made for the Army and Navy.

Aircraft and airport instruments manufactured by the firm include barometers, altimeters, attitude barometers, gyroscopes and tachometers, microscopes, thermographs, etc.

thermographs, thermographs, anemometers, wing gyroscopes, hypodermic compasses, altimeters, balloon microscopes, attitude gauges, and microscopes. A full line of Taylor instruments are on display at space C-2 at the Chicago show.

The present Taylor Instrument Companies officials are Herbert J. Wain, president and treasurer, James Ely, vice-president and general manager, and H. W. Kinnell, secretary.

The Texas Co.

The Texas Co., a subsidiary producer of gasoline and engine lubricating oils, which maintains its general office at 17 Battery Place, New York, N. Y., has been supplying gasoline to the Army and Navy for many years. In the last few years, the company has taken an active interest in aviation, and now owns and operates a Ford three engine, all-metal monoplane. This plane is used for transporting the officials of the company about the country. At the Chicago show, the oil company is exhibiting its aviation products.

Texas Pacific Coal and Oil Co.

The Texas Pacific Coal and Oil Co. of Fort Worth, Tex., was founded in October, 1888 at Thayer, Tex. In November, 1927, this concern entered the aero field by supplying to operators "TP" aero engine lubricating oil and "TP" aero engine lubricant. "TP" aero oil has been approved by leading aircraft engine manufacturers, such as Pratt & Whitney and Wright Aeronautical Corp., according to officials of the Texas Pacific Company, who say that this oil was used in the endurance flight in which a number of world's records were made by the Navy Flycatcher FN-32.

Its complete line of aircraft lubricating oils is exhibited at the Chicago show by the company. This exhibit is in charge of H. J. Evans, manager of the St. Louis sales division office and other officials of the company.

The Texas Pacific Coal & Oil Co.'s present officials are Edgar J. Munson, president; E. R. Lechner, vice-president and in charge of refinery; O. E. Mitchell, vice-president; Larne Smith, vice-president, and R. Seibel, secretary-treasurer.

Tulvander Oil Sales Corp.

This company is now celebrating its 50th anniversary, but it has only been actively pushing the aeronautical end of its business since 1927. During this short time, however, the products of the company have won many laurels. Officials of the company cite the fact that Commander Byrd is using "Tydol" gasoline and "Veezol" oil on his South Pole explorations, and that the "Graf Zeppelin" and Taivander products on its return flights to Germany. Adolf Goedel, Clarence Chamberlin and other well-known pilots have also used Tydol and Tydol. The company owns a Bellanca plane which was flown by first Baroness at the Los Angeles race. There is a special department in the company dealing in aeronautical products and this is in charge of W. C. Zimmerman.

The present officials of the company are Axel J. Byla, president, and E. L. Shea, vice-president. At Chicago it has a particularly well arranged booth for the exhibit of its products and the endorsement of the many friends and users of the products.

Travel Air Manufacturing Co.

The Travel Air Manufacturing Co., one of the best known commercial aircraft builders, was organized at Wichita, Kansas, on Feb. 5, 1925. Beginning with the production at that time of a three-place, open cockpit biplane, powered with war surplus OX-5 engines, the company has increased its activities to the manufacture of two types of four-place and four-place biplanes and five types of biplanes powered with Whittle, Challenger, Warner Scarab, Hispano-Suiza and OX-5 engines. This firm is said to have the largest distributor organization, consisting of 300 distributors and dealers, throughout the country. It also has representatives in many foreign countries.

The Travel Air planes were winners of the 1925 and 1926 Ford Reliability tours. Another notable achievement of the Travel Air airplane was the San Francisco to Honolulu flight which won the \$250 prize for "Arc" Goebel. The company has made steady progress in manufacture since the date of organization and is now producing from 15 to 20 planes per week.

Two planes are on exhibition at the Chicago Show.



Left to right—Walter Bosch, president, Travel Air Mfg. Co., O. E. Sweeney, president, Sweeney Aircraft Corp., Clarence Vaughn, president, Chance Vought Corp.

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one of the new type biplanes and a simplex Travel Air monoplane.

An arrangement has just been made that Rayless, Stone & Co. of New York has assumed a 50 per cent ownership in Travel Air, and word has been given out that a contract has been let for a new factory of approximately twice the capacity of the present Travel Air plant. The officers of the new company will be the same as at present: Walter C. Bosch, president; Thad C. Carver, 1st vice-president; J. H. Turner, 2nd vice-president; W. R. Snook, secretary, and C. G. Yalagis, treasurer. The firm expects to move that double its present production when the new factory is completed. It expects to fly the present Travel Air field as soon as the city of Wichita takes over its new 640-acre airport.

Timken Roller Bearing Co.

The Timken Roller Bearing Co. was organized at Canton, O., in 1898. It has been closely associated with the aeronautical industry since its inception and supplies bearings to practically all of the manufacturers. The case may enter the aircraft industry several years ago when it began supplying landing wheel and tail wheel manufacturers with Timken tapered roller bearings. A number of aircraft wheel manufacturers have now standardized on Timken bearings. Timken bearings are also being used on crankshafts and roller arms of aircraft engines. The Timken exhibit at the Chicago show consists of Timken bearings for wheels and engines. Timken Roller Bearing Co. is under the management of H. H. Timken, president, M. T. Leshop, vice-president, and J. F. Strong, secretary and treasurer. General offices and plant are located at Canton, Ohio.

E. S. Twining & Co.

E. S. Twining & Co. was organized in New York City as a partnership between Edward S. Twining and John H. Twining, in 1922. In 1924, the company entered the aero field by presenting to the industry "Flipline," an airplane fabric made from long strand Egyptian cotton. This is a close woven, textured product which gives a maximum strength. The firm also builds a sub-product known as the "Aerite,"

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similar to the one carried on Commander Byrd's plane, the "America."

E. S. Twining & Co. is exhibiting at the Chicago Show a roll of Flipline fabric, rolls of Twined Edge Wing Tape of various sizes and a complete line of reinforcing tape. The exhibit also includes photographs of a number of new production planes covered with Flipline. Some other interesting features are shown including Aerite.

E. S. Twining & Co. operates from 320 Broadway, New York, under the management of Edward S. Twining and John H. Twining, the original partners.

Vacuum Oil Co.

The Vacuum Oil Co., 61 Broadway, New York, N. Y., was organized in 1896, with oil as its main carrier. M. V. Hiram Bond Evence was the first president.

Records of the company show that Mobilol was supplied to the Wright brothers, Curtiss and Hamilton in 1910. It is the best of the firm that Mobilol was used for engine lubrication by many prominent pilots when they set out to make aeronautical history.

The main exhibit of the Vacuum Oil Co. is a large map of the world with the outstanding historical flights, between countries or cities in America and Europe, where Mobilol was used, shown in colored lines. The flights include the New York to Paris flight made by Guy Gourd, as well as his tour of the United States and Central America, Comdr. Richard Byrd's first flight to the North Pole, Miss Amelia Earhart's trans-Atlantic flight, the around-the-world flight by the U. S. Army fliers, the flight of Captain Wilkins to the Pole region, "Arc" Goebel's flight from San Francisco to Honolulu, and Lieutenant Maughan's dawn-to-dusk flight across the United States. In addition, the company is showing a collection of various pictures of Capt. Gourd, as well as his tour of the United States and Central America, Comdr. Richard Byrd's first flight to the North Pole.

The firm is now located at 343 S. Dearborn St., Chicago, Ill., and the present officers of the company are Edward Priser, chairman of the board; G. P. Whaley, president of the board; C. E. Radford, C. E. Arant, and W. M. McLean, vice-presidents and treasurer, and Herbert Baker, vice-president and treasurer, and H. V. Hoffman, secretary.

Chance Vought Corp.

Chance Vought Corp., well-known airplane manufacturer with headquarters at Hurdon and Revere Aves., Long Island City, N. Y., was organized in 1912 and is the successor to the earlier Lewis and Vought Corp. The first model produced by Chance Vought Corp. was the VLS-1. This was introduced in 1918 and was used extensively by both the Army and Navy. The LTD series were the next planes produced by the company, and were adopted by the Navy for observation and training models, which included outcropping from battleships and cruisers and landing and take-off from aircraft carriers. The latest Vought model is the "Corsair." This was particularly well received and is now in use in both the military and commercial fields.

The planes manufactured by Chance Vought Corp. have all been built to the designs of Chance M. Vought, who is the assistant treasurer and chief engineer of the ac-

tionment. Mr. Vought first learned to fly in 1910 and since that time has devoted his entire energies to aviation. Before actively entering the industry as a manufacturer, he designed and built a number of successful planes. His experience in flying and designing is reflected in all of the models that the company has produced and is responsible in a great extent for the success with which these planes have thrived.

The Corsair biplane and the interchangeable wing gear is on exhibit at the display of the Vought company this week at the Cokerns. This plane has also been designed as an amphibian.

The present officers of the company, aside from Chance Vought, are George W. Vought, president; Robert B. Knowles, vice-president, and Lisa Lewis Vought, secretary-treasurer.

Velle Motors Corp.

The Velle Motors Corp., Moline, Ill., was organized in November, 1926, to manufacture automobiles. W. L. Velle was president, F. E. Bradfield, vice-president, and O. E. Monahan, secretary and treasurer.

This firm entered the automobile field in February, 1928, when it began the production of airplanes for aircraft. As present the company is producing two engines, one a five cylinder, 45 hp., and the other a six cylinder engine, used to develop 380 hp. Both engines are radial air cooled types. Two engines manufactured by the Velle Motors Corp. are on display at Chicago.

W. L. Velle, Jr., is now vice-president of the concern and A. T. Fleming is secretary and treasurer.

Van Schick Bros. Chemical Works, Inc.

Van Schick Bros. Chemical Works, Inc., Chicago, Ill., was organized in 1914 by R. H. Van Schick, Jr., president; K. H. Van Schick, Sr., vice-president and L. L. Van Schick, secretary and treasurer. Since its founding the concern has manufactured and has furnished the aero industry with nitric oxide. As the demand on the part of the industry increased this company created a line of sulphur incinerator flasks which it is now producing in addition to nitric oxide. The full line of Van Schick products is extensively displayed at the Chicago Aircraft Show.

The original offices are still at the head of the concern which is located at 3238 Avenida Ave., Chicago, Ill.

Westinghouse Electric & Manufacturing Co.

The Westinghouse Electric & Manufacturing Co., manufacturer of electric equipment and allied products, was organized in 1886 by George Westinghouse, its first president. The company entered the aero field in 1917 by supplying electrical equipment to aircraft manufacturers and airports during the World War. Progressing in the aeronautical department to the present date, it is now manufacturing complete airport lighting equipment, airway beacons, radio beacons, microwave propellers, gages, fuel leads, shunting and instruments. The worth of the new product, the Micron propeller, was proved by their use as equipment on the "Boeing" in its flight over Australia. Westinghouse airport lighting equipment is now installed in many airports throughout the United States including some of the most important.

Complete airport lighting equipment, Macarta gas-pilels, palleys, air leads, sheeting and light and power plants are at the Westinghouse space at the Chicago Show.

The Westinghouse Electric Co. is under the management of R. M. Blair, president; F. A. Mierick, vice-president and general manager, and the following vice-presidents: Walter Gary, H. P. Davis, H. T. Herr, E. D. Kilburn, L. A. Osborne, W. S. Reiss, H. D. Sells, C. A. Terry, and J. C. Bussett. General offices and factory are located at East Pittsburgh, Pa.

The Volkswagen Company

"Volkswagen" parking and garages have long enjoyed a large distribution in the automotive industry. The original products of the company were "Volkswagen" sheet padding and gaskets, which have been in use by automobile manufacturers since about the beginning of automobile building.

"Volkswagen" is a sheet padding made especially for the oil, gasoline and water connections, and was first introduced into the auto field when it was supplied to the pioneer plane builders.

The Volkswagen Co. is displaying all of its products at the Chicago Aircraft Show.

Wright Aeronautical Corp.

The origin of the Wright Aeronautical Corp. dates back to 1909 and the original Wright Company, which was organized by the Wright firm and a group of New York capitalists in order to develop the Wright airplane. Owing to the small demand for aircraft, it was impossible for this company to progress much until the World War. Prior to the outbreak of the War, the Wright firm had ceased to have any personal interest in the Wright Company or its management and its control passed into the hands of bankers.

Before the entry of the United States into the War, the management of the Wright Company required control of the Stinson Automobile Co. of New Brunswick, N. J. With this merger completed, arrangements were entered into with the Hispano-Suiza Co. in France, after which the American rights

to the manufacture of the Hispano-Suiza aircraft engine were secured and a quantity of these engines were produced for the French Government.

In order to finance the proposed operations and equip the plant with sufficient machinery, the Wright-Martin Aircraft Co. was organized in 1915 and merged with the Wright Company.

From 1917-1919, the Wright-Martin Aircraft Co. turned out approximately 10,000 Hispano-type engines of 300 and 320 hp for the U. S. Government. At the end of the War, the plant at New Brunswick was sold to a motor truck manufacturer and approximately 75 per cent of the Wright-Martin Company's capital was distributed to its stockholders as a partial liquidation dividend.

The Wright Aeronautical Corp. was then organized and moved to its present location in Paterson, N. J. The present plant including buildings to be completed by the end of 1930, has over 1,000,000 sq. ft. of floor space. In 1925, through a merger with the Lawrence Aerial Engine Corp., the company acquired all rights of the Lawrence air-cooled engine.

The Wright Whirlwind engines were used on all of the successful trans-oceanic flights of the last two years, as well as on other notable air ventures. Among the many famous pilots who used Wright Whirlwind engines are Lindbergh, Chamberlin, Maitland and Hagenberger, Byrd, Brock and Schell, Smith, Goebel, Stettin, Hildebrand, and Knudsen Smith.

The company has an display at the Chicago show all of the new Wright aero engines including the 525 hp "Cyclone" and the following J-6 series: 180 hp, five cylinder model, the 225 hp, seven cylinder model, and the 300 hp, nine cylinder model.

The present officers of the company are Charles L. Lawrence, president; Richard Hoyt, chairman of the board of directors; Guy Vanhousen, vice-president; and James F. Proctor, secretary and treasurer.

Werner Aircraft Corp.

Werner Aircraft Corp., producer of the Warner "Javelin" engine, was organized in October, 1926, with headquarters at 2912 S. Grand Blvd., Detroit. Much airplanes powered with Warner Spiral radial engines

AVIATION
December 1, 1930

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won first, second, third and fourth places in class A of the 1928 National Air Races, New York to Los Angeles A 110 hp. Spiral engine is being exhibited by the main pavilion at the Chicago show.

The offices of the firm are now located at 4042 Jefferson Ave., Detroit, Mich. The executives are Newton Stillman, president; William O. Werner, vice-president; Edward N. Hartwick, treasurer; and William J. Jarrow, secretary.

Wilson Steel Products Co.

The Wilson Steel Products Co. was organized in 1901 for the manufacture of rails, wire, rivets and tools. It entered the automobile industry a short time ago when Charles Arvin, designer of the Aero control jointed the organization, giving the firm the manufacturing and sales rights on its products. A factory of approximately 100,000 sq. ft. has been built for the manufacture of these controls and production at a quantity basis has already begun. The Aero controls are being exhibited by the Wilson Steel Products Co. in its booth at the Chicago Show.

The firm, at present located at 440 S. Western Ave., Chicago, Ill., is headed by John Gossnell, president; M. W. Van Auden, vice-president; and Philip W. Gossnell, secretary and treasurer.

Wyman-Gordon Co.

The Wyman-Gordon Co. has been manufacturing forgings since 1883, when the company was organized as a partnership by L. F. Gordon and H. W. Wyman. This firm supplied forgings to the automobile industry from its beginning. In 1919, it entered the aero field and during the World War, manufactured thousands of crankshaft forgings for the United States, England, France and Italy. Since the War, it has been supplying many of the leading American aircraft engine builders with crankshafts and other vital forgings. The company is exhibiting crankshafts and other forgings at Booth Y-3, at the Chicago Show.

The management of the company is G. F. Potter, president; H. G. Rosdell, vice-president and general manager; and F. A. Lupton, vice-president. The company's plant and administrative offices are located at Worcester, Mass., with sales offices in Detroit, Michigan and Paris, France. It also operates the Ingalls Ship and Division at Harvey, Ill.

The following firms are also exhibiting at the Chicago show:

Name	Exhibit
Aero Model Co.	Motor engines
Aerovox Utilities Corp.	
New York, N. Y.	
Aircraft Engine Corp.	Engines
Oakland, Calif.	
Albion Aircraft Co.	Plane
Affinity, N. Y.	
Belden Manufacturing Co.	Insulation and Parts
Chicago, Ill.	
Binks Spray Equipment Co.	Paint
Chicago, Ill.	

Name	Exhibit
A. P. Blakely	
New York, N. Y.	
Selsky Hosiery and Co.	Molier Fabrics
New York, N. Y.	
Oslo Service Oil	Oil
Chicago, Ill.	
Ington Airplane Engine Co.	Engines
Detroit, Mich.	
Edgely Machine Co.	Structures
East Chicago, N. J.	
Emerson Tins and Rubber Co.	Tires
Albion, O.	
Emerson Transportation Co.	Boats
New York, N. Y.	
W. H. Gaudin and Sons	Propellers
Forest Park, Ill.	
Harrison Aeronautical Manufacturing Co.	
Milwaukee, Wis.	
Harwell Products	
Chicago, Ill.	
Kenner Airplane Motor Co.	Engines
Glendale, Calif.	
National Steel Products Co.	Parts
Dayton, O.	
New Departure Manufacturing Co.	Ball-bearings
Broad, Conn.	
Morris A. Northing	Engines
Wilmington, Mass.	
Ohio Gasoline Tube Co.	Seamless tubing
Shelby, O.	
Parker and Company	Insulators
Philadelphia, Pa.	
Phoenix Knight Aircraft Co.	Plane
Oak Park, Ill.	
Pyle-National Co.	Lights
Chicago, Ill.	
H. H. Robertson Co.	Model barges
Birmingham, Pa.	
Ross-Wins Co.	Electrical Wires
Rosier, N. Y.	
S. & H. Model Airplane	Models
St. Petersburg	
Standard Automatic Products Co.	
Corry, Pa.	
Stinson School of Aviation	Airplane
Detroit, Mich.	
Strass and Borgeles	Goggles
Brooklyn, N. Y.	
Tano Manufacturing Co.	Equipment
Minneapolis, Minn.	
Union Oil Co.	Oil
Los Angeles, Calif.	
Westinghouse Lamp Co.	Lamps
Brooklyn, N. Y.	
Wood-Corwin Co.	Salt
Chicago, Ill.	



Left to right—N. B. Lambert, Westinghouse Electric Mfg. Co.; Charles Arvin, Wilson Steel Products Co.; Charles L. Lawrence, president, Wright Aeronautical Corp.

K. L. M. Opening Service to Indies

To Operate Fokkers Monthly
Between Holland and
Batavia

AMSTERDAM, HOLLAND—Royal Dutch the latest (K.L.M.) now announces that in January it will inaugurate a regular monthly service over the 2,150 air route to the Dutch East Indies.

The announcement follows experimental flights in which Fokker biplanes placed carrying some 100 lb. of mail material in 12 days. This was effected by means of a clock line which to the west, which was the greater part of the route. A civil, regular service will be possible in soon as adequate equipment for night flying is provided.

The primary of the route will be Amsterdam, Budapest, Constantinople, Baghdad, Basra, Athens, Karachi, Alibab, Calcutta, Madras, Singapore, Melbourne, and Batavia. Beyond Batavia, trips to Borneo, Dutch Japan, Moluccas and other countries are possible. Also, for business, mail and pleasure, will be made with a stop at Singapore which also Palembang, and flights may be made to Saigon from Medan, or with.

Sheet Flights for Genl

PRIDGESCHAFEN, GERMANY—Mail a dozen short flights will be made in the coming future in the Graf Zeppelin, according to an announcement making that there are too flighty to comply with the requirements of the German Air Force. The Graf Zeppelin, a 100,000 lb. airship, will be made with a stop at America will not be made this year, because the supply of fuel gas is expected to be at present sufficient.

Control of Civil Flying is Asked

LONDON, ENGLAND—A committee for unified control of civil flying in Great Britain has been put before the General Council of the Associated British Airplane Clubs for consideration, according to the American Consul-General, London.

The address given for a control administration organization which would take charge of all flying clubs, provide them with airplanes, engine inventors, and select airports. In addition, it would control the routes and passenger-carrying lines. The committee hopes the Government will lend its aid in some form such as permission for each new pilot trained.

Travel Air in Melbourne Race



Showing an O-25 Travel Air of the fleet of the recent Doris Gandy held at Melbourne, Australia. The plane, owned by Mr. Raymond Gandy of that city, averaged 100 m.p.h. in the event.

R.A.A.F. Orders 26 Wapiti

MELBOURNE, ENGLAND—The Royal Australian Air Force has placed an order for 26 Wapiti biplanes which fitted with Bristol Jupiter engines. The first order of 26 Wapiti biplanes will be placed by the Australian Government.

Junkers Announces A Supercharged L-55

BERLIN, GERMANY—Among the regular manufacturers in the Supercharged Junkers L-55, a normal L-55 power plant fitted at the rear end with a supercharger.

The compressor motor is driven in a speed of between six and seven times that of the crankshaft by use of plain gear teeth and an intermediate coupling or shaft. No clutch on the crank is available but it is claimed that it never will only be to save or decrease the supercharger, but to increase the power and the rear engine should result from working in greater speed and also to vary the speed of the rotor.

Check How Two Controls

The check is governed by two controls. One is connected by automatic pressure and the other by the pilot. This dual control arrangement makes it possible to put the supercharger in action and allow it to maintain normal induction pressure up to some 10,000 ft. or 15,000 ft. Of the pilot may use it to give a temporary artificial boost at the take-off, or other purposes.

In this engine the compressor is between the compressor and the cylinders so that the compressor drive will be direct and not with mixture. A special, low-back valve protects the compressor from back-flow through the turbocharger.

Seeks Bureau Air Base

BUREAU AIRS—Infinite steps toward the establishment of the Berlin-Bureau Air Base are under way and the Bureau is now seeking of Civil Engineer Bureau to inspect several locations reported as suitable for an airport. Colonel Harnisch, the chief, Spanish representative about the Gull Zeppelin on its westward flight.

THE BUYER'S LOG BOOK

Friez Wind Tachometer

REMOTE READINGS of wind velocity may be obtained by the use of the wind tachometer developed by Julius F. Friez & Sons, Baltimore, Md. This device is included in the complete line of weather instruments manufactured by that company. The Friez wind tachometer consists of a three cup anemometer rotor coupled to the shaft of an electric tachometer which generates a current the voltage of which varies directly with the speed of the rotating cups. A specially calibrated voltmeter graduated in m.p.h., shows the actual velocities in wind speed.

The three cup rotor is balanced and built strictly to the specifications of the U. S. Weather Bureau and test bearings are used at both ends of the spindle. Both tachometer and voltmeter are manufactured by the Western Electric Instrument Co. A set with wiring is provided at \$100.00, making the instrument reliable and increasing the factor of safety against loose connections, poor wiring or defective brushes. Many parts of generator and voltmeter are interchangeable.

Two types of wind tachometer now produced by the company. The No. 1204 is furnished with gilded direction letters and a wind vane to be used in cases where it



The No. 1204 three cup wind tachometer developed by Julius F. Friez & Sons

is desirable to observe wind direction as well as velocity. The No. 1203 is furnished without wind vane or direction letters. Both are designed to be mounted on a standard 1 1/2 in. iron pipe or on a standard type of support, 8 ft. high, manufactured by the company. Two styles of dial or indicators also are available. One is equipped with long sticks for use on a stretch-horn panel and the other with a metal back to hang on the wall. As many as twelve indicators can be supplied to operate on the same line and can be located as far as 12 mi. from the transmitter. Two No. 10 B. & S. gauge wires are required for connection between the transmitter and indicators. Both indicators are graduated from 0 to 90 m.p.h.

The Friez wind tachometer requires no outside source of current since the entire system is energized by the force of the wind. It is therefore useful in isolated locations where an electric power is desirable.

Crouse-Hinds Beacon

ONE OF the most important airport lighting devices in the revolving beacon and, in view of the demand for this apparatus, the Type DCB-24 has been developed by the Crouse-Hinds Company, Syracuse, N. Y. This beacon is of rugged construction and is designed in such a way as to require a minimum of attention. It does not require much more than a few minutes of attention.

The Type DCB-24 revolving beacon is equipped with a cast aluminum silicon non-corroding alloy barrel. All construction including motor, reduction gearing and control magnet, is mounted under the base and protected by a casing. The beacon can be equipped with any of the standard Department of Commerce color wheels for flashing the auxiliary corner lights. It revolves approximately six times a minute. The barrel may be elevated or depressed in the vertical axis and a system of levers is provided to cut off the light beam below the horizontal. The beacon revolves in either three bearings mounted in oil and control is carried to it through brushes and slip rings.

Current lines standard universal lighting circuits may be used and the required voltage can be obtained by the use of a small transformer. Light sources include a 1000 watt, 110 volt lamp or T-30 bulb with incandescent filament, a 1000 watt, 32 volt lamp with T-30 bulb with incandescent filament and a 1000 watt, 32 volt lamp with a T-24 bulb.

The beacon can be furnished with Zenith light pencil in the housing. These control of line pneumatic pilot strips mounted in the top half of the housing directly over the incandescent lamp. They are designed to concentrate the direct lamp rays into a narrow fan of light directed upwards. The purpose of this device is to enable the pilot to locate the beacon when he is above the base lines of the aerodrome.

A 1/2 hp. motor is furnished for 110 volt D.C. or 60 cycle A.C. and motors for other voltages and frequencies can be supplied. Separate leads for water, fuel and lamp leads are brought in a separate block in the base. A hole for entrance of 1 1/2 in. conduit also is provided in the base.

The Crouse-Hinds beacon has a front plus of 25 inch diameter and may use of several types of glass may be used. The beacon is equipped with three way leveling mechanism and pegs which so that the lamp may be brought to the local point of the reflector. A lamp changer, or device which automatically places a spare lamp in place after one has burned out, also can be supplied.

Mohair Interior Fabrics

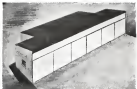
AFTER MANY years of experience in production of mohair fabrics for automobile upholstery, the Shofar Looms, 305 4th Ave., New York City, is now offering its products to the aeronautical industry. A number of mohair fabrics particularly adapted to use in finishing airplane cabin interiors are now available. By the company and samples will be sent to those interested on request.

The use of mohair fabrics for upholstery and trimmings gives a luxurious appearance to cabin interiors and permits a choice and arrangement of harmonious coloring.

Kocher Hangars

A COMPLETE line of wooden hangars designed for various airport requirements is offered by the George T. Kocher Lumber Co., 226 S. Jackson St., Lima, O. These hangars are shipped knocked down and furnished with complete blueprints and instructions to erect. The company guarantees sufficient material including lumber, millwork, hardware, roofing and paint. Several standard models are stocked but special designs will be executed if desired.

The No. 104 or "H" model is a one plane hangar 36 ft. wide, 28 ft. deep and 14 ft. high of the "T" type.



A drawing of the No. 104 two-plane "H" type wooden hangar built by the George T. Kocher Lumber Co.

Designed to house planes having wings up to 35 ft. A sound grade of yellow pine is used for framing lumber and this is covered with matched or tongue and grooved siding suitable for paint. Galvanized steel roofing is provided and doors are made to slide in the roller on overhead track. A total clearance of 30 ft. in height is afforded. The front depth clearance is 19 ft., 8 in., and the depth of the roof overhang is 14 ft. The No. 105 is a two plane "T" type hangar similar to the Leaper Special. In this hangar, an above and under nose space is provided in the rear or tail compartment.

The Kocher No. 106 is designed for one or two planes and is rectangular in shape and has an arch roof. It is 40 ft. wide, 35 ft. deep and 18 ft., 6 in. high and open is provided for an office. Dimensions of the No. 109 one plane hangar are 36 ft. by 28 ft. by 14 ft. This model is a "T" shaped building, and like the others, has sliding doors.

Any desired capacity in excess of three planes can be obtained by using the No. 130 hangar and the units which may be added to it. The size of the three plane hangar in 18 ft. wide by 28 ft. deep. The inside dimensions are the same as those of the Leaper Special and space for any number of planes may be obtained.

Johnson Tail Wheel

A FREMATIC fixed tail wheel to replace the usual tail skid on airplanes has been developed by the Johnson Airplane & Supply Co., Dayton, O. This wheel can be mounted on a 1/2 in. diameter bolt, weighs 10 1/2 lb. complete and will support a load of 2,500 lb. It will support 500 lb. in 25 per cent deflection of the tire.

The Johnson wheel is equipped with a tandem bearing. It was developed in cooperation with the tire manufacturer and is fitted with 24 by 3 in. straight side tire with all weather tread.

Rome Trenchlay Cable

TRENCHLAY CABLE has been developed by the Rome Wire Company, Division of General Cable Corp., Hazen, N. Y., to meet the demand for an underground cable impervious to the attack of moisture, earth acids and alkalies and other forms of demagnetization, easy to handle and not subject to electrolytic corrosion, nor to local erosion and shorting losses. It is being used for power distribution in a number of airports. Three types of cable for different uses are manufactured in the company. They are known as power, control and signal types.

A special corrosion resistant rubber compound has been developed for this mounting the individual conductors in Trenchlay cable. Double faced rubberized cloth tape is tightly applied with a full one-quarter inch lap continuously over the rubber insulation in the power type. In the higher voltage version this tape is applied before the rubber insulating sheath is vulcanized. An additional reinforcing sheet of dense cotton braid saturated with special moisture resistant compounds is applied over the individual conductors of the power type cable.

The reference lead cable, which provides the homogeneous used throughout the entire structure of all types of Trenchlay is the result of long and intensive research. A heavy dense sheath of leaded asbestos, impregnated with special moisture resistant compounds is employed where lead sheet is ordinarily used in underground cables. Tough, well impregnated fibrous tapes are employed for armor and heavy, full stranded wire is employed for the final or outer sheathing of all types.

Rome Trenchlay is made in many sizes and multiples and for various working pressures. Soft drawn tunnel copper conductors, solid or stranded according to the use for which it is designed, is employed. A complete illustrated catalogue is issued by the company.

Anchor Wire Fences

AIRPORT OPERATORS throughout the country are realizing the importance of providing sufficient protection for operations and planes by providing adequate fences for their fields. The Anchor Post Fence Co., Eastern Avenue and 205 St. Albans St., Hudson, Md., is now offering its products in quantities constituting the economic solution.



One of the hundreds of Anchor Field, Eastern Island, N. Y., showing electric chain link fence.

The company manufactures chain link fences, iron railings and gates. Also the Anchor Post Fence Co. is manufacturing an Anchor fence for the Mather Field, Staten Island, N. Y., Logan Field, Baltimore, and the City of Detroit Airport. Anchor products are also used in enclosing industrial property.

Chromilite Floodlight

THE CHROMILITE landing field floodlight, manufactured by the Westinghouse Electric and Manufacturing Co., South Bend, Ind., has been specially designed for use in the Westinghouse system of airport lighting. The design of this lamp permits mounting one in the ground and through the use of a multiple arm arm around illumination can be obtained if the size of the field is increased.

The Chromilite floodlight consists of a weather resistant steel drum protected by several coats of paint and enamel, with provision for mounting on a 2 1/2 in. pipe standard. The diameter of the drum is 26 in. and the depth 19 in. with overall dimensions of 35 in. by 21 in. A 21 inch serrated disk chrome plated reflector is provided and has such a focal length that a three degree beam divergence is obtained. All rays of direct light having an upward inclination exceeding 7 1/2 deg are intercepted by a system of louvers. Downward rays are not intercepted and serve to illuminate the ground in front of the arm. Reinforcing spread lines can be supplied to fan out the beam horizontally to 30-45, or 90 deg. The lamp socket is equipped with a three way focusing device. Horizontal rotation is vertical shaft 2 deg. above and 7 deg. below the horizontal are provided in the mount and a high degree of accuracy in setting is possible.

Strong base sockets are regularly supplied for use with 3500 watt and 5000 watt 42 volt lamps. The type No. 345490 projector is equipped with a clear lens and a single arm socket for use with 115 volt projection or



Two views of the Chromilite landing field flood light manufactured by the H. Chromilite Company.

floodlight lamps. In addition the louvers have been omitted from this unit so that it may be used for long throw spot floodlight or incandescent searchlight applications. Several other models, differing in lamp equipment are manufactured. The net weight is 160 lb. and the shipping weight 150 lb. A complete line of projector lamp units also is stocked.

Reliance Adapters

INCLUDED IN the Reliance line of tachometer drive adapters manufactured by the Reliance Steel-wheel Co., 308 Broadway, Cambridge, Mass., are two models designed to drive two Model F series Reliance Tachometers off the same engine connection. These adapters are furnished either in solid brass, bronze or aluminum and S.A.E. or U.S. A.C.S. fitting.

The Model X-43 is a straight type adapter having a 1 to 3 increase ratio for use where the two drive cables are to lead in the same direction and the Model X-45 has the same ratio and other specifications but is suitable for installation where it is desirable for the cables to lead in different directions.

SIDE SLIPS

By ROBERT R. ORSHAN

At a recent meeting of the National Academy of Sciences, there seemed to be considerable discussion about the location of the center of the universe, as all scientists apparently do not agree on this point. When this matter is settled and is not of the now, we have a little more difficult problem for them to solve. According to our conventional mode of investigation there are some eight thousand cities claiming to be the "last restful" and "settled capital" of the United States. Possibly they could draw up this situation a bit by selecting an All-American sort of "last capital" for us.

After a poor full of long distance flights which have been constantly postponed for one reason or another it is pleasant to find an honest airport who, according to H. L. C., made the announcement "Absolutely and positively we make take off Friday!"

According to the news from Los Angeles, airplanes flying over the stadium have sometimes interfered with the making of "traded" money pictures. From the point of view of many people this is just another great use for the airplane which makes it such a boon for humanity.

It seems to be always possible to avoid anything. For instance, C. E. H. reports that a friend of his had the muffler removed from the engine in his plane because he was, on other days recently, and after driving the field for 30 man without being able to attract any attention, had to land without field lights.

An editorial in a large New York evening newspaper had the heading, "An Aerial Marvel!" and the following statements under that heading:

"The plane rose from the landing field and discovered a 60 mi. gate in the upper air. It traveled like a plane the wind, threaded the engine down to a 60 mi. speed and discharged its dispatches, released with high efficiency for an hour. The force of the wind and the power of the engine balanced each other, and the pressure of the wind on the wings of the plane kept it aloft as though it were moving through the air. The ability of the pilot to pit his engine against the wind and locate accurately for an hour remains the challenge."

If this effort would like to give his comrades not only a stress, but a real good workout some day we'll take him out and throw him a "lover" flying backward in a wind with the clouds with open.

The Imperial Airline came in the office the other day with a very good chance for speaking up the perfection on experimental airplanes, which we gain along to our readers. The says that the present generation of airplane designers are so improving by nature, that their designs almost always start with a 100 hp. which is replaced by a 200 hp. engine after the first flight test, or start with a 300 which is replaced with a 400. He proposes to issue a guide information in all departments with the present state in hand, and as they will then inadvertently use the correct one engine the rest of the flight test and redesign will be saved.

The Wheels and Brakes the Entire

Every important airplane manufacturer in the United States is using Bendix Wheels and Brakes.

This universal and unbiased endorsement classifies Bendix Wheels and Brakes as one of the most vital contributions ever made to the safe and efficient operation of airplanes.

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We do not make shipment of heavy rollers, channels, steel sheets and steel

doors from it to the customer to assemble and erect the steel work in the field. We supply the sheets in the form of the building with doors or windows strips. It is not at all the usual, efficient, unskilled labor, which field work often costs the customer as much, and usually as he pays for the building. It is a

fact, but we ship to you a complete building with about 30% premium work already done in our shops.

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To erect SHEPARD HANGARS start at the rear end and bolt together and install the sliding bottom plate in corner bolts in foundation, then bolt together a few sections on each side make gable end truss, which is also attached with galvanized steel sheets, then rivet and bolt on the first main truss, bolt on the roof gables and beams, then raise some more side wall sections, raise next truss and so on (see picture showing section view), after which hang the sliding doors at front of the building, work roof sheets and glass the ends, and the building is ready for business.

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